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The Vail Telegraph Instrument.

The proposition for the purchase by the Government of Stephen Vail's telegraph instrument, to which reference was made in the last issue of the REVIEW, deserves more than passing notice. The bill, introduced in the Senate by Senator John R. McPherson, of New Jersey, and referred to the Library Committee, names $10,000 as the price of the machine, and authorizes its purchase upon the production of such evidence of its authenticity as shall be satisfactory to the Secretary of the Smithsonian Institution. As heretofore reported, the instrument is now in the National Museum (which is closely identified with the Smithsonian), its authenticity has been clearly established by the officers, who have investigated the subject, and its ownership by the Government is greatly desired. The Museum is regarded as the best place for its safe-keeping and exhibition.

The question of the proper amount to be paid is largely a matter of sentiment, rather than justice, and gives rise to a wide range of opinion. But the most striking feature of the bill goes much further than this in an apparent attempt to wipe out the credit heretofore given to Professor Morse and Professor Henry as originators of the Morse telegraph and to declare that Alfred Vail was the inventor. The preamble to the bill is as follows:

"*Whereas*, Stephen Vail, of Morristown, N. J., has in his possession the original telegraphic instrument or recording receiver, *invented by his father, Alfred Vail*, used upon the first telegraphic line ever constructed (that between Washington and Baltimore) and to transmit the first message ever sent: 'What hath God wrought;' and

"*Whereas*, Mr. Vail has in his possession abundant and satisfactory proof of its authenticity, and the proposed disposition of it is strongly recommended by the officers of the Smithsonian Institution (where it is now on exhibition"), etc.

The scheme of establishing historical and scientific facts by a majority vote of a body of politicians is novel and interesting, but this will undoubtedly hinder rather than help the passage of the bill. There are excellent reasons for stating that the officers of the Smithsonian and the Museum will not support the measure in its present shape. Much regret is expressed, especially by persons who recognize Vail's valuable work in the development of the telegraph, that this attack upon his associates should have been made.

The Typewriter Transmitter.

The experimental telegraph transmitter exhibited by O. D. La Dow to the railway telegraph superintendents on the occasion of their annual convention in October, has been perfected and the details of construction made public. In some respects it is similar to an ordinary typewriter, having a bank of keys, each one of which represents a letter or other symbol. A single stroke of a key transmits a perfect Morse letter. Each key-lever carries a pivoted sector, which, upon depression of the lever, is pressed upon a revolving felt-covered roller, by which the sector is moved forward through a short space until the letter is completed, and it then drops back to its place. The sector is made of metal, with insulating blocks set in its edge in such a manner that the conducting portions, in passing over a light contact-spring, make the desired combination of dots and dashes. It is expected that the principal use of this transmitter will be by expert Morse operators rather than by novices. It is claimed that it will greatly lessen the labor of sending by the Morse code, while every letter will be made in proper proportion and with mechanical exactness. Mr. La Dow estimates that 45 words per minute can be transmitted with the greatest ease, against 20 words by the ordinary Morse key. Of course, a typewriter will be used for receiving. The system will be specially adapted to press matter and other long messages. Mr. La Dow has given an option for the purchase of his patent to a party of western capitalists, including some prominent telegraph officials, and it is understood that the instruments will be put in use without much delay.

A Suggestion of the Phonograph in a Seventeenth Century Fable.

The idea of the magnetic telegraph is said to be certainly 300 years old. But the phonograph was believed to be a comparatively new notion. Mary Somerville, indeed, predicted that before the end of the present century we should probably possess a means of recording and reproducing speech; but the like conception turns out to be far older than that.

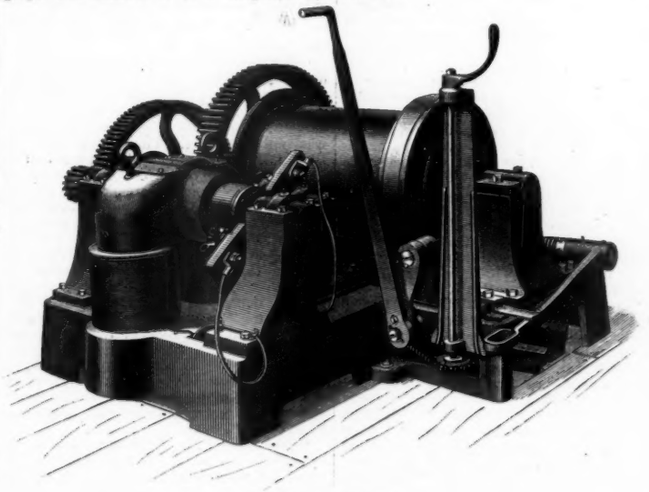
In the middle of the seventeenth century M. de Bergerac, a well-known French writer of his day, and a forerunner of Jules Verne, published, says the N. Y. *Times*, a fabulous account of a visit to the moon, which contains an account of two mechanical books left in the city of the moon by a visitor from the sun. In opening one of these books the narrator states that he found "somewhat of metal almost like to our clocks, full of I know not what little springs and imperceptible engines.

"It was a book, indeed, but a strange and wonderful book that had neither leaves nor letters. In fine, it was a book made wholly for the ears and not the eyes, so that when anybody has a mind to read it he winds up that machine with a great many little springs, then he turns the hand to the chapter which he desires to hear, and straight as from the mouth of a man or a musical instrument proceed all the distinct and different sounds which the lunar grandees make use of for expressing their thoughts instead of language. I no longer wondered that the young men of that country were more knowing at 16 or 18 years old than the gray beards of our climate, for, knowing how to read as soon as speak, they are never without lectures."

A suggestion of the electric light is also contained in the same work, where one of the characters appears with two bowls of fire "so sparkling that all wondered he burnt not his fingers."

Our World's Fair Disadvantages.

W. C. Brownell, the author of "French Traits," in an article on "The French Exposition," in the January *Scribner's*, points out three disadvantages against which, as compared with the French, we shall be compelled to struggle if we undertake an exhibition in 1892. They are: (1) that we possess no site which can be compared for fitness with that which Paris possesses; (2) that we have no competent organization directed by a long and splendid tradition of æsthetic dignity and taste to create and control the exhibition of 1892; (3) the absence of any body of engineers, architects, sculptors and decorators at all commensurate in numbers and æsthetic tradition.



ELECTRIC HOIST.

Death of Hon. Edward N. Dickerson.

Edward Nicoll Dickerson, a very widely-known and eminent member of the bar of New York, died last Thursday morning at his residence in Far Rockaway, L. I., at the age of 65. Mr. Dickerson was one of the most prominent and successful patent attorneys and advocates of the country, and was associated with Mr. Storrow in the famous American Bell Telephone cases.

At the time of his death, Mr. Dickerson was vice-president of the Electric Club of this city, and had recently delivered a very interesting lecture before the Club on the steam engine. In addition to his legal knowledge he was familiar with the whole history of steam, being both theoretically and practically a mechanical engineer, and having for a time acted as engineer of the first locomotive engine that was put in operation between Paterson, N. J., and New York City.

Mr. Dickerson was a man of commanding ability and most agreeable social qualities, and leaves a very large circle of friends to mourn his decease.

An Electric Hoist.

One of the recent applications of electricity for general power purposes is the electric hoist, which is shown in the accompanying illustration. In this particular field horses have been supplanted by steam, which in turn, is now supp'anted by electricity, there being the same advantages in this piece of apparatus which are found in the stationary motor for ordinary power purposes.

The electric hoist, manufactured by the Thomson-Houston Electric Company, is simple in construction, compact, easy to manipulate, and does the work required quickly and well. The motor is of the same class as employed for stationary work, with the exception that it is series wound, the speed being regulated by a rheostat placed underneath the drum, and controlled by a handle at the operator's right hand. The friction clutch is controlled by a slight motion of a lever held in the left hand of the operator, and is so well adjusted that the heaviest loads can be raised, lowered or held without the use of the brake. The brake consists of an iron strap lined with wood, and encircling the drum for more than three-fourths of its circumference; it can be applied by a simple pressure of the foot. The pinions and gears are made of alternate disks of rawhide, and run comparatively without noise, while the use of carbon brushes reduces the wear on the commutator to a minimum.

This machine is now on exhibition at the Maritime Exposition, Boston, where it has been the subject of much favorable comment.

You Can Iron Your Silk Hat with the Incandescent Lamp.

An enterprising young electrician in Washington, recently married, who had occasion to spend the evening down town with some friends from New York, was shocked to find, as he was about to go home, that his new silk hat had, in some unexplained manner, become badly rumpled. Shops that "block your hat while you wait" had long been closed and, for a moment, Benedict was in distress, but his ingenuity did not fail him. Stepping into a restaurant lighted by electricity he soon found an incandescent lamp attached to a long flexible conductor, and with this he deftly and quickly ironed out the wrinkles from his battered tile and hastened home to his waiting wife.

Storage Battery Award.

Mr. D. H. Bates, vice-president and general manager of the Electrical Accumulator Company, informs us that C. A. Faure received the only gold medal for invention awarded for accumulators at the Paris Exposition. It was announced in the REVIEW a few weeks ago that a gold medal had been awarded to the Societe l'Electrique of Brussels, and while this is true, the award is for the general merit of the exhibit and good workmanship, and does not relate to the question of invention.

The first of the calendars to be in the field comes from the Cleverly Electrical Works, Philadelphia. Two very handsome ones have been received at this office, and will be placed on duty January 1, 1890.

INJUNCTIONS DISSOLVED.

JUDGE ANDREWS' ORDER IN THE ELECTRIC LIGHT CASES REVERSED BY THE STATE SUPREME COURT.

The Supreme Court, General Term, on Friday of last week announced its decision upon the appeal by the Mayor, Board of Electrical Control and the Commissioner of Public Works from the order of Judge Andrews restraining them from interfering with wires and apparatus of the electric illuminating and power companies of New York City. Presiding Justice Van Brunt wrote the opinion of the Court, and Judges Barrett and Brady also wrote opinions, in which they concur with the presiding justice.

The leading opinion covers 47 pages, Judge Barrett's 26 pages, and Judge Brady's but five pages. The shortness of Judge Brady's opinion was occasioned by his lengthy engagement in the Court of Oyer and Terminer. The order is reversed and the injunction dissolved.

Chief Justice Van Brunt states at length the facts of the case, and quotes the laws for the organization of electric light companies and for the placing of wires underground, and then says:

"It seems to us that two questions are presented by this appeal, and they are, *first*, even if the Board of Electrical Control, in these cases where subways have not been provided, have refused permission to these plaintiffs to make such repairs as were necessary to keep their plant in a perfect and safe condition, will such refusal excuse the plaintiffs for their violation so to do? And, *secondly*, has the Commissioner of Public Works the power to abate a public nuisance existing in the streets of the City of New York, dangerous to the lives of its citizens, without first going to the creator of the nuisance and informing him of the discovery of its existence by the authorities, and requesting him to abate the same, and thereafter waiting before proceeding to protect the lives of the citizens for some indefinite length of time, called a reasonable time, in order to see whether the creator of the nuisance will abate the same or not. That the latter is a proposition presented by this appeal seems to have been conceded by the learned counsel for the plaintiffs upon the argument, and also by the learned judge in the court below. It was admitted upon the argument that in the conduct of the business in which these plaintiffs are engaged, the wires employed for the conducting of the currents used by them for the purpose of lighting and the furnishing of power, unless perfectly insulated, are dangerous to human lives; and without this admission, occurrences have taken place which demonstrate the proposition. The plaintiffs, therefore, are conducting a business by means of an apparatus and a force which, unless properly controlled, subjects every passer-by in the streets of New York to the danger of death. They are therefore bound in the prosecution of that business to use the highest degree of diligence, and if it is impossible for them to conduct their business without subjecting the passers-by upon the streets of the city to danger, although without negligence on their part, then it is doubtful whether the Legislature even could, without closing the street or public highway and making provision for compensation to all parties damaged thereby, confer authority for the conduct of such a business upon the public streets of this city, because it would be giving up the streets to a purpose for which they had never been dedicated.

"The proposition, then, which is presented is, in view of the rule of law requiring the plaintiffs, because of the dangerous character of the business which they are conducting, to use the highest degree of diligence, when the plaintiffs have failed to comply with this obligation, and when human life is threatened because of this failure, have not the public authorities, or, for that matter, any citizen, the right to at once remove such danger as a common nuisance? We think there can be but one answer to this proposition; and that under such circumstances the law allows this summary method of doing justice, because injuries of this kind require an immediate remedy, and can not wait for the slow progress of the ordinary forms of judicial procedure. In other words, human life is more sacred than the form of legal procedure. When it is apparent, as in the case at bar, that the condition of the wires of the plaintiffs is such that they are dangerous to human life, and that any passer-by, without negligence on his part, is liable to be struck dead in the street, can it be said for a moment that the public authorities have no power to abate this nuisance, and protect the lives of its citizens? Indeed, it is one of their highest duties, and if they allowed such a condition of affairs to continue, might make the city itself liable for the damages sustained by reason of their negligence in not removing the common nuisance. But it is said upon the part of the plaintiffs 'that our large investment of capital is thus left to the mercy of the public authorities, and that we are at least entitled to some notice of the defects complained of, that we may remove the same.' This proposition involves the claim upon the part of these corporations that the public authorities shall perform a duty which the law devolves upon themselves, namely, the proper inspection of their own apparatus, which is liable to become dangerous at any time, and the immediate remedying of the difficulty. It is not a part of the duty of the public authorities to inspect the apparatus of private corporations and warn them when such apparatus becomes dangerous to human life. There is one fact which seems to be established beyond question upon the papers before this Court: and that is, that at the time of the commencement of these actions the wires of these plaintiffs had become excessively dangerous by reason of their defective insulation. Attention was called to this condition of affairs by the happening of accidents by which human life was sacrificed, and the great strife seems to have been between the electrical companies and the Board of Electrical Control as to upon whom the blame for this shameful condition of affairs was to be imposed. The companies claim that the Board refused arbitrarily to allow repairs to be made which were requested by them, and that the rules and regulations of the Board regulating these repairs were unreasonable, and they were in consequence unable to keep their wires in that condition which their plain duty required should be done. But even if this state of affairs existed it was no excuse to the plaintiffs. They had ample remedies at their hand for the purpose of compelling the Board of Electrical Control to give them permits for the making of repairs if such permits were unjustly refused. The courts were open to them, and it is a familiar principle that where a permit upon the part of any of the city's officers is improperly refused a mandamus may issue to compel the performance of that public duty.

"But these plaintiffs, when their wires got into such a condition concededly as made them public nuisances, endangering human life, made not the slightest effort to compel the Board of Electrical Control, if they unjustly refused, to grant them permits to repair; and this is a very significant circumstance when we take into consideration the dispute that arose between the Board of Electrical Control and the plaintiffs. If these electrical companies had been actuated by the slightest desire to put their apparatus in a condition such as would not endanger human life, they could easily have found a way to remove the obstruction which they claim was placed in their path by the Board of Electrical Control. It would seem that they were only too willing to attempt to shelter themselves behind the assumed unreasonableness of some of the regulations of the Board, and allow their apparatus to get into such a condition that it was dangerous to human life and became a public nuisance.

"In the determination of the question as to whether the Commissioner of Public Works should have been enjoined in the removal of those wires which were not properly insulated, it is not necessary for us to consider or discuss this dispute. The mere fact that the Board of Electrical Control refused permits to which the plaintiffs were entitled forms no excuse for their allowing these wires to get in this condition and remain so for the periods of time established by the papers before us. There is no question but that if the operation of their system had depended upon the procuring of these permits to which they were entitled, the plaintiffs would have found ready means to call the Board of Electrical Control to reason. But by sheltering themselves under this, as they now claim, unauthorized action of the Board, they undoubtedly thought themselves excused from the expenditures of money necessary to render their apparatus safe for operation. As has already been said, this forms no excuse for a longer time than would have been necessary to make an application to the courts to enforce their rights against the Board of Electrical Control.

"It further appears from the papers in this case that at the time of the commencement of these suits the wires of these companies were in a terrible condition in respect to imperfect insulation, and they were a menace upon all sides to the safety of the passer-by upon the public streets. The Commissioner of Public Works, under these circumstances, in view of his duty to remove obstructions from the streets, whether dangerous to the citizens or otherwise, had a duty devolved upon him to abate the nuisance at the earliest possible moment. It is true that in taking such action he did so at his peril, and in an action brought against him for the violation of the property rights of any one of these companies he would be bound to show such a condition of affairs as rendered the existence of the wires so removed a public nuisance. It is claimed upon the part of the plaintiffs that the Commissioner of Public Works asserted the right to remove a whole line of wire because of a single defect. This, however, does not seem to be clearly established. He undoubtedly had no right to remove more than was necessary to abate the nuisance. But this right existed in the Commissoner of Public Works in common with any other citizens who desired to use the streets of the city. It is undoubtedly true that no power other than that connected with his office was conferred upon the Commissioner by the resolution of the Board of Electrical Control, or the direction upon the part of the Mayor. The contingency had not arisen which authorized the Board of Electrical Control, as a body, to put the Commissioner of Public Works in motion; nor was the Mayor authorized to confer any authority upon the Commissioner in respect to this matter which he did not enjoy by virtue of his office.

"Therefore, in the consideration of this question, it has not been deemed necessary to discuss the action of the Board of Electrical Control or of the Mayor. It has also been assumed that these plaintiffs have a right to continue and maintain overhead wires until the subways should be ready, provided such wires are maintained in such manner as not to be dangerous to human life; and that they have the right when such wires become out of repair to repair the same, subject to the reasonable regulations of the Board of Electrical Control, and that it is the duty of said Board if necessary to give the plaintiffs permission to do so."

The Chief Justice quotes approvingly from the opinion of Judge Andrews where he says the action of the Commissioner should not be controlled by the opinion of the expert of the Board, but says that the injunction granted by Judge Andrews was essentially too broad in restraining all action on the part of the Commissioner of Public works until the companies should have an opportunity to remedy defects pointed out by him. The Commissioner, both as a private citizen and by virtue of his office, has the right to remove obstructions which had become dangerous, without notice to plaintiffs. As the claim that only the Board of Health has the right by the charter to abate nuisances, the Presiding Justice says:

"It may be true that the Board of Health, under the peculiar phraseology of the act conferring power upon them, would have the right to remove these wires, because dangerous to human life. But their power was not exclusive. The Department of Public Works had the rights also and it is its duty to keep the streets of the City of New York in a passable condition, and to remove all obstructions which interfered with their use, and therefore had ample authority to abate this nuisance. If this was not so, will a Court of Equity intervene to restrain the abatement of a nuisance by the public authorities, simply because the proper department is not acting? We think not. The nuisance existing, the Court will not limit its abatement to any particular officer of the municipality, unless the exclusive power is plainly conferred upon one department. Even then, the right of an officer of the municipality to act as a private citizen in a perfectly clear case would not be affected.

"The counsel for the respondents, while apparently conceding the right of the Commissioner of Public Works to remove an imperfectly insulated wire, urges that the right of removal must, in the first place, depend upon a determination by the Commissioner of the condition of the fixture, and that he has no right arbitrarily to determine, without notice, and without affording the plaintiffs an opportunity to be heard, and if the pole or wire is defective or unsafe it should not be removed, or a nuisance abated, without granting to the plaintiffs an opportunity to remedy the alleged defect. That the Commissioner should not act arbitrarily without a determination as to the condition and existence of the nuisance is undoubtedly correct. But where a party erects and maintains knowingly a public nuisance in the streets of New York, necessarily dangerous to human life, we know of no rule of law which requires the public authorities or the public to abandon the streets until the party maintaining the nuisance shall have an oppportunity to be heard as to its existence, and after such hearing, an opportunity to remove the same. In his proposition the learned counsel seems to us to overlook the important fact that it is because of the gross negligence of the plaintiffs that these wires were allowed to become a public nuisance, as they are conceded to have been at the time of the commencement of this action.

"The plaintiffs have been guilty of a willful violation of a manifest duty in allowing these wires to become dangerous. They are without excuse, and when they claim that the destruction of these instruments of death, maintained by them in violation of every duty and obligation which they owe to the public, is an invasion of their rights of property, such claim seems to proceed upon the assumption that nothing has a right to exist except themselves. It is idle to say that a party knowingly maintaining a nuisance which may at any time deal death to innocent passers-by can for an instant be entitled to the protection of the law in its maintenance. If these plaintiffs had been without fault, a different question might have been presented. But it is evident that they were guilty of the highest degree of negligence. The Commissioner had authority, both as a private citizen and a public official, charged by the duties of his office with the removal of obstructions from the streets of the city, to abate the nuisance complained of. Some of the affidavits contained in the record appeared to claim that the Commissioner of Public Works, although not acting wantonly in his attempts to abate the existing nuisance, yet he either had been removing or threatened to remove, before the hearing of the motion in the Court below, certain wires which were not in a defective condition. We have not deemed it necessary to advert to these claims because the complaint, as filed, contains no averments under which proof of such facts would be admissible, and as the relief granted must depend upon the allegations of the complaint, no such question is presented for consideration.

"It follows, therefore, that the order appealed from should be reversed."

JUDGE BARRETT'S OPINION.

In his opinion, Judge Barrett says:

"We start with constitutionality of the Act of 1885 deliberately settled by the Court of Appeals (Squire's case, 107 N. Y., 593). A careful comparison of that act with the Act of 1887 shows no such divergence in the latter enactment as to render its constitutionality doubtful. This has been affirmed in several cases."

Continuing, the Judge says: "The plaintiffs have undoubtedly acquired property rights and franchises of which they can not be deprived without just compensation. They are duly incorporated under legislative sanction. They have obtained the consent of the local authorities to their corporate use of the streets, and they have obtained this pursuant to legislative direction. Upon the faith of this authorization from the law-making power, they have expended large sums of money, and otherwise acted upon the legislative license. From this condition of things two propositions flow: First, the license having been acted upon, and something done by the licensee in consideration thereof, it has become invested with the qualities of a contract. Second, such of the companies' operations as may reasonably be said to have been contemplated by the Legislature cannot be deemed a nuisance. So far as the public is concerned, the legislative power within its constitutional limits is substantially omnipotent. A proper construction of this fourth section, therefore, calls for the clear recognition of two cardinal considerations: First, that there can be no implication of a legislative intention to deprive the plaintiffs of their vested rights. Second, and on the other hand, that there can be no implication of any such intention to authorize inherent nuisance; not merely something which but for legislative sanction would constitute an illegal structure in the highway, but something essentially *malum in se*. Thus viewed, there is little difficulty in giving this section a reasonable and harmonious interpretation, just to the companies and not inimical to the public welfare."

The Judge continues that to maintain existing fixtures, apparatus and wires until the completion of the subways required no fresh permit from the new Board of Electrical Control. But they could not supplement such fixtures, apparatus or wires, nor otherwise add to their existing systems, without such a permit. Nor could they continue the use of defective wires, until they were rendered perfectly safe. The Judge adds that the Legislature conferred upon the Board the power to refuse or grant permits. This power must be exercised reasonably and is continuous.

"If the plaintiffs' entire systems are necessarily and unavoidably dangerous to human life, as matter of fact they can be restrained or abated by appropriate proceedings, for, so far as their mode of using electricity is thus dangerous to human life, it is without legislative authority, express or implied, and the systems, under such use, become nuisances. But the entire structure can not be summarily destroyed, if the particular nuisance can be otherwise restrained or abated."

Continuing, the Judge says that the corporate authorities can not by their mere

declaration make that a nuisance which in fact is not. He cites authorities which, he holds, "abundantly establish for the proposition that *Commissioner Gilroy had a right summarily to abate the common nuisance of any non-insulated wire found to exist in the plaintiffs' systems.* He had this right, both individually and officially; and he was not dependent for his justification upon either the resolution of the Board or the order of the Mayor. Nothing whatever," says Judge Barrett, "should be permitted to stand between the officer of the municipality and the actually non-insulated wire; nor should he be hindered or delayed for one moment in his laudable purpose of protecting his fellow citizen by its neutralization. If in destroying its deadly force the officer exceeds his duty, the remedy at law is ample.

"So long as the officer acts fairly and moderately, without wantonness or oppression, he has nothing to fear. At all events, the last thing that should be set in motion to paralyze his honest efforts for the protection of human life, is the power of a court of equity exercised on mere motion *pendente lite*. In my judgment this part of the order should be reversed, and the injunction as to Gilroy wholly dissolved. That part of the order which enjoins the Board of Electrical Control from preventing repairs was clearly unauthorized. It is in the nature of a final mandatory judgment, and is in effect a peremptory mandamus granted before trial in an equity suit. The facts upon which it was granted showed that the only substantial dispute was as to the right to replace old wires by new ones, larger in size and of greater conductivity. The general right to repair had been conceded long before the commencement of these suits. Upon these facts the utmost that the plaintiffs would have been entitled to, even in a proper proceeding, was an alternative mandamus; and in view of the discretion vested in the Board with regard to fresh constructions, and the probability that such discretion covered larger wires of greater conductivity, even an absolute denial of an application for mandamus would have been justified.

"Both upon the facts, then, and the law regulating such procedure, this part of the injunction should fall with that which has been the main subject of consideration."

JUDGE BRADY'S OPINION.

This opinion is as follows:

"I concur with my brethren that the order appealed from should be reversed.

"Whatever rights the plaintiffs have acquired by legislative grant are subject to the dominant loss of public safety, and it must be assumed that such rights were secured and invoked with knowledge of this controlling principle. The Legislature has no power to violate it, and consequently none to authorize an enterprise to be conducted in the public streets by the use of a death-dealing factor, unless the conditions imposed surrounding and controlling it are such as to secure the public safety, not for a time, but for all time during its use. And whenever this safety ceases to exist business immediately becomes a nuisance more or less, and may be abated as such by any citizen who chooses to exercise the power, he assuming only the responsibility of proving it to be as asserted.

"Indeed, the object of the subway for which the Legislature called and provided by various acts is undoubtedly, in part at least, based upon the dangerous character of the plaintiffs' business and the legislative duty of securing the public safety. The creation of a business extra-hazardous in the public streets, or of organizations to use elements therein dangerous to life from their very nature, can only be legal, if at all, when they are so burdened as to secure the public safety, preliminarily to such use and its continuance, by the untiring, and, indeed, unfailing vigilance of the person or corporation. If this cannot be done, then a nuisance is created and exists, and not a lawful enterprise.

"There should, in other words, be no intervals of this safety when life may be sacrificed by the condition of some instrument or agency used in the business.

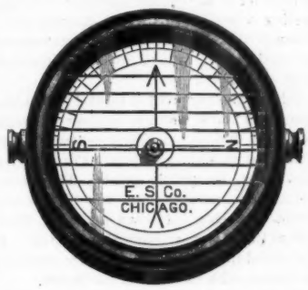
"This may seem to be a severe, even a harsh, rule, but the duty to secure the public safety—the lives of citizens—renders its enforcement imperative."

A New Engineering Company.

Mr. C. J. Field, formerly general manager of the Edison Electric Illuminating Company, of Brooklyn, has organized the Field Engineering Company, 15 Cortlandt street, New York, of which he is president and general manager, and Mr. E. F. White, secretary and treasurer. They will act as consulting and contracting engineers in regard to electric street railways, electric light and power plants and steam plants. The REVIEW extends its best wishes for the success which this company will certainly win.

Mehren's Current and Pole Indicator.

The little instrument illustrated herewith (full size of the cut) was designed to show the presence and direction of current in electric wires. The detector is a galvanometer of the direct reading form. The case contains a magnetic needle, attached to and between two card board faces, upon which are plainly marked indicator arrows. When the instrument is placed underneath a wire having at that point a general north and south direction, if a constant current is flowing through the wire, the needle being deflected carries the card round and the indicating arrow on the bottom of the instrument shows the direction of the current flow.



Now, if we place the instrument above the wire the arrow on the other face of the card will indicate the same condition.

There are several decided advantages apparent in the Mehren indicator. It can be used in many instances where other forms of indicators are interfered with, because of the wire being close to the ceiling. It is direct reading. Whether used above or below the wire, it invariably shows the direction of the current flow. It does away with all artificial memory as to which way a given current above or below the needle will deflect the needle.

In addition to the above uses for the indicator, it is an exceedingly convenient little instrument for detecting breaks in a circuit, by connecting it up through the binding screws shown in the cut, and for laboratory or experimental purposes will be found convenient and useful.

The patent for this instrument was granted in November, 1889, and it is placed on the market by the Electrical Supply Company, Chicago, to whom all correspondence should be addressed.

New Brighton, Pa.—A charter was granted to the New Brighton Electric Street Railway Company, with a capital stock of $50,000. The directors are James R. McKee, F. K. Brierly, W. C. Simpson, Geo. F. Kennedy, Oliver Molter and T. L. Kennedy. The line will extend from Fourth street, Beaver Falls, to the lower end of New Brighton.

Hamilton, Cnt.—W. E. Sanford, George Roach, Alexander McKay, M.P., R. M. Wanzer and R. E. Kennedy, have applied for letters patent incorporating a company to be called the Hamilton Electric Light Company, with a capital of $200,000. The objects of the company are stated to be the purchase of the present electric light premises, plant, franchises and contracts, and the carrying on of the business of supplying electricity for light, heat and power in the city of Hamilton and within a radius of 10 miles thereof. It is expected that by the beginning of the year the company will have in operation, including the city contract, over 350 arc lights and 2,000 incandescent lights.

New York City.—The papers were filed at Albany last week for the incorporation of the New York City Suburban Surface Railroad Company, with a capital of $200,000, and permission to increase the capital stock to $1,000,000. The incorporators are ex-Mayor Franklin Edson, Hugh N. Camp, H. W. T. Mali, Daniel D. Conover, Richard Kelly, Maxmillian Fleischmann and J. P. Baiter. They propose to construct a single track road between Fordham Heights, Fordham and Tremont, running from the northerly end of McComb's Bridge along Sedgwick avenue to Burnside avenue, to Tremont village, with a branch from Burnside avenue to Woodlawn Cemetery in Central avenue. The northern terminus will be at the southwest entrance to the cemetery. The company will operate electric motors carrying their own power.

South Berwick, Me.—The Berwick and Salmon Falls Electric Company has been organized at South Berwick, with a capital stock of $9,800.

Peabody, Mass.—The Naumkeag Street Railway Company, of Peabody, Mass., has been granted a charter by the selectmen of Peabody to use the overhead trolley wire system under conditions similar to those laid down by the city of Salem. The conditions must be accepted within 30 days and the system be in operation by the 1st of next July.

Randolph, Mass.—The Randolph and Holbrook Light and Power Company has been granted a franchise to operate a plant in Randolph, Mass. One of the conditions is that the work of building the electric road before the first day of April next, to which effect the selectmen have received a guarantee. The Thomson-Houston electric railway system will be used.

San Francisco, Cal.—The San Francisco Electric Light and Power Company was incorporated with $1,000,000 capital stock, divided into 100,000 shares of $10 each, of which $35,000 has been actually subscribed. Seven directors have been appointed for the ensuing year, as follows: Martin Bulger, Robert P. Hastings, William McMann, J. M. Chenowith, W. C. Clark, H. G. Platt and J. S. Humbird, of Pittsburgh, Pa.

Philadelphia, Pa.—The United States Construction and Pipe Manufacturing Company has filed articles of incorporation. The objects of the corporation are the manufacture of pipe and laying them for subways—for gas and electricity, etc. The capital stock is $100,000, of which $1,000 is paid in. The incorporators are Alfred H. McIlvain, Wm. H. Murphy and Theophilus G. Murphy, of Philadelphia, and J. Joseph Murphy, of Camden.

Edwardsville, Ill.—In the Edwardsville Court was presented recently a petition of the Electric City and Illinois Railway Company *vs.* Elizabeth J. Isbell and others, to condemn land for railroad purposes. The road will extend from East St. Louis, in St. Clair county, to the approach to the St. Louis Merchants' Bridge, in Madison county. As soon as the petition is granted the building of the road will be pushed as rapidly as possible.

Minneapolis, Minn.—The Minneapolis Electro-Matrix Company has elected the following board of directors: S. S. Small, E. J. Edwards, C. L. Travis, J. W. Griffin and C. A. Pillsbury, of Minneapolis; Erastus Wiman, of New York; Lowe Emerson, of Cincinnati, and Theo. C. Bates, of Worcester. The directors chose these officers: President, William M. Grosvenor, of New York; vice-president, C. L. Travis; secretary and treasurer, C. Wright Davison.

Nashville, Tenn.—Application was made for a charter for the newly consolidated Nashville street railway lines under the title of the United Electric Railway Company, by J. M. Fogg, I. T. Rhea, T. W. Wrenne, Wm. Morrow, A. H. Robinson, M. F. Gardner, H. R. Buckner, J. H. Bruce, R. W. Turner, John P. Williams, Max Sax, W. C. Debrill, J. H. Fall, Wm. Duncan, Frank Morrow, N. Baxter, Jr., and T. O. Morris. The charter sets forth the right of way owned by the company running through the city and suburbs and including all the lines in the city. The company propose to use electric power on the whole line.

Martinsburg, W. Va.—The Edison Electric Illuminating Company met at the office of Faulkner & Walker last week, and completed their organization by the election of Messrs. M. W. Martin, president; Stuart W. Walker, secretary, and Hon. Geo. M. Bowers, treasurer. All of the stockholders were present, and a board of directors was elected. H. T. Warner, of Washington, president of the Loan and Trust Company; Geo. Truesdell, president of the Washington Street Electric Railway Company, prominent business men and capitalists, are largely interested in the enterprise. The company purpose having all the work completed by the 1st of February for the lighting of Martinsburg by electricity.

Keyser, W. Va.—The Keyser Electric Light Company is organized and ready for business.

Allegheny, Pa.—The State department granted a charter to the Wilkinsburg Electric Company, of Allegheny county; capital, $30,000.

Lansing, Mich.—The Secretary of State issued a license to the Mount Pleasant Electric Company, of Mount Pleasant; capital stock, $25,000.

Beatrice, Neb.—The Beatrice Electric Company has arranged to incorporate and go into the extensive manufacture of electric supplies of all kinds at that point.

Petersburg, Ill.—The Electric Light and Power Company, of Petersburg; capital, $25,000; incorporators, G. D. Wright, J. H. Strodtmann and T. W. McNeely.

Tallapoosa, Ga.—A contract has been granted to G. F. Quackenbush for a 270 sixteen candle-power Edison electric light plant for lighting the town. Estimates are invited.

Olathe, Kas.—The Olathe Electric Light and Power Company, of Olathe. Directors, B. T. Whitmore, W. B. Henry, Wellington Adams, Chas. Sutler and Moses L. Cohn; capital stock, $25,000.

Chicago, Ill.—The Turner Electric Lighting Company, at Chicago; for renting and operating electric lights; capital stock, $10,000; incorporators, D. B. Turner, B. B. James and George N. Morgan.

Tacoma, Wash.—The Tacoma Steam and Electric Power Company of Tacoma. Capital stock, $25,000. Trustees, James C. Lupton and John J. Hicks, Jr. Object, to supply steam and electric power.

New Berne, N. C.—The New Berne Gas Company has organized a new company, with A. H. Leftwich as president and U. S. Mace, secretary and treasurer, to erect the electric light plant in connection with their gas works.

Siskiyou, Cal.—The Eastern Union Telegraph Company of Siskiyou has been incorporated, to build a telegraph line from Mott, Siskiyou county, by way of McLeod River, Fall River Valley, Bieber and Adin to Alturas and the Oregon line.

Gonzales, Tex.—The Gonzales Water Power Company has been incorporated to develop the water power of the Guadalupe river by building a dam, as previously mentioned. The company proposes to furnish power for water works and an electric light plant.

San Leandro, Cal.—The San Leandro Gas and Electric Light Company has filed articles of incorporation, with a capital of $100,000, to which $500 has been subscribed by each of the following directors: William J. Landers, B. C. Hawes, James A. Goodwin, F. B. Reynolds and S. A. Brooks.

Milwaukee, Wis.—The North Greenfield Advancement Association is talking of building an electric railway on the National Avenue road from the city limits to the North Greenfield station of the Northwestern road. Charles Cuppel, Paul Bechtner, John Johnson and others are said to be interested in the project.

Sacramento, Cal.—Mayor Gregory and Trustees Wolf and McLaughlin returned from San Francisco, having been there for the purpose of looking at various electric light plants, with a view of making a purchase of machinery for manufacturing the city's own light. They will receive estimates and bids for lighting the city.

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We invite correspondence from Electricians, Inventors, and the Telegraph and Telephone fraternity and those engaged in Electric Lighting, on matters pertaining to electrical and scientific subjects, and all facts of special interest in connection therewith.

We extend to manufacturers of electrical apparatus an invitation to send to this office any and all facts concerning their business which will be of interest to the public. We make no charge for publishing news.

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NEW YORK, DEC. 21, 1889.

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On dit Mayor Grant's polarity is very strong just now, and has produced the greatest fall of electrical potential ever known to science. This should charge him with enough energy to last the rest of his life.

Now the coroner's jury have the workman Sullivan killed by shock due to 120 volts. Is it not about time to look into the matter a little more thoroughly and determine once for all how much depends upon the *quantity* of electricity received through the human body? There must be much dependence on this, it would seem. Else how comes it that the shock of very many thousand volts from a static machine can be taken without much inconvenience?

The National Electric Light Association will have much to do at its next convention.

The phonograph is being improved constantly. Its latest form is said to be incomparably superior to the phonograph of a year ago. This is to be expected, and it is also to be expected that every change for the better will be a simplification of the mechanism. So far such has been the fact.

It is a sign of progress that the educational institutions of this country are rapidly falling into line by inaugurating courses in electrical engineering more or less extensive. This is as it should be. The time is coming, and with rapid strides, when the profession of electrical engineering will be one of the, if not the most important calling among the educated classes of the world.

A Western inventor is endeavoring to interest capital in his electrical magic lantern for casting or reflecting advertisements on the dark clouds that often hang low over a city. The inventor claims to have secured contracts from several well known firms for displaying their cards in this manner. If the idea is fully developed we may expect to see some very startling and grotesque effects. This idea originally appeared in the editorial columns of the REVIEW.

It is a fact very often exemplified in any business, and especially in the electrical business, that it is not so difficult to obtain an initial order for a central station electric lighting plant as an order for an increase. In the first instance the sale depends largely upon the ability of the salesman to convince the would-be purchaser of the superiority of his system of electric lighting. But an order for an increase depends entirely upon the advantageous qualities of the plant itself. A corporation will only increase its plant when the system adopted is giving entire satisfaction.

The telegraph business of the country is evidently looking up. The statement of the earnings of the Western Union for the last quarter is said to make the best showing of any in the history of the company, and the executive committee has recommended the regular dividends of 1¼ per cent. and an extra dividend of ¾ per cent. It is reported also in financial circles that the Postal Telegraph Company is earning 12 per cent. on its capital stock. This is a pretty good indication that people in this country believe in patronizing the telegraph and that such patronage is continually increasing.

The case of the telephone company of Cincinnati against the electric railway, same city, is looked upon as a test case that will settle many of the differences now existing between the telephone and the electric railway interests. There are always two sides to every question, and the telephone people must realize that there is a great demand for the rapid transit that electricity furnishes; and on the other hand, when the railway people, through inferior construction, almost destroy the telephone service along their line, they cannot expect either telephone user or manager to tamely submit. There is a political maxium of Mr. Chas. A. Dana's that applies to these two branches of electrical work: "Get together."

The recommendation of the Commissioner of Patents that the salaries of his official staff should be increased one-third, should receive prompt attention in Congress. The remarks of the Commissioner in making this recommendation are very pertinent. He says: "In view of the arts which have been discovered from time to time, the diligence with which they are developed by the most eminent scientists in the world, and also in view of the growth and expansion in all the fields of research and knowledge, a higher order of talent and ability is essential for the proper examination of applications for patents than when the salary was established in 1848. Unless Congress shall recognize this fact, and make provision accordingly, this office will continue to be used as a place of instruction for young and capable men, who, so soon as equipped and trained as to make their services of value to the Government, resign their positions to accept more lucrative employment in private life."

ELECTRIC LIGHTING IN NEW YORK.

The decision of Judge Andrews granting an injunction in favor of the local electric lighting companies against the city officials has been dissolved by the Supreme Court. The opinions of the three judges are published elsewhere. The Commissioner of Public Works has the authority not only as a public official, but, as one of the judges state, as a private citizen, to remove these wires.

It is not the province of the REVIEW to question the decision of so capable and dignified a body as the Supreme Court of this State, yet we regret to see the reiteration of such terms as "public nuisance," "death-dealing wires," "danger to human life," "struck dead in the streets," "instrument of death," etc., which appear all through these opinions.

It is but another proof of the fact that public opinion is much wrought up over the situation, and that our judiciary has caught the somewhat reckless and popular tone which prevails in the public prints. The streets are again in darkness, and wires, poles and lamps are being cut down under the direction of the Board of Electrical Control. It is claimed that only such wires are removed as conflict with the rules of the Board.

The electric light companies have recently put up a vast amount of expensive wire. To have this torn down and taken possession of by the city, as is now being done, works a great injustice to the electric light interests.

There have been a number of accidents to life in this city from electric light wires, and two more deaths were reported from this cause last week. Such accidents do not occur in other large cities, and the explanation is a simple one—they do not have political boards of electrical control. We have in New York a Board, vested with immense powers, that is totally unfit for its responsibilities. In the language of the grand jury, which two weeks ago sent in a stinging presentment, the New York Board is "negligent" and "incompetent," and "should be removed."

Had there been competent electrical engineers and scientists put in charge of this work at the first we would not have had these accidents in New York city. We hope yet to see such men appointed.

ATMOSPHERIC ELECTRICITY NOT USEFUL IN FORECASTING STORMS.

The Chief Signal Officer will report in reference to the systematic observations of atmospheric electricity carried on for several years under the supervision of Prof. T. C. Mendenhall, that "the primary object of the work was to determine whether observations of atmospheric electricity could be made useful in weather forecasting." Early in the progress of the work the extremely local character of the phenomena exhibited became evident. It was found that instruments, similar in every respect, separated by a distance of a few hundred feet, might give very dissimilar indications. The comparison of similar observations at five-minute intervals, extending through several days at the various stations, failed to show any similarity of fluctuations or movement of electric disturbance from one part of the country to another. The relations between the electrical conditions of the atmosphere and local weather conditions were carefully studied with the hope that the results might afford assistance in the prediction of local storms, which offer so much difficulty in forecasting by present methods.

The well-known electrical activity during such storms was made the subject of special examination, attention being particularly given to the appearance of negative potential in connection with precipitation. The investigation abundantly proved that negative electricity may be observed without being in any way related to precipitation, past, present, or future, and that it may be due to other causes.

Taking all the facts into consideration, it seems to be proved that the electrical phenomena of the atmosphere are generally local in their character and they do not promise to be useful in weather forecasting.

ELECTRICAL NEWS.

What is Transpiring in Electrical Circles in the Leading Cities.

OUR BOSTON LETTER.

Electric Sweeper.—One of the electric sweepers which the Thomson-Houston Electric Company have made for the West End Company, has been given a trial and found to work very successfully. All along Tremont street the sidewalks were lined with interested spectators. The brushes cleaned the tracks of mud completely, and without spattering it on the spectators.

Protection for Wires.—Great interest is being manifested in this city in all schemes for the protection of buildings into which electric wires run. The general consent seems to be for something which will entirely cut off or shunt the current when it becomes too heavy for the wire to carry it safely. Numerous appliances are being tried, among others the Brown electric protector, which went through a satisfactory test last Wednesday. The invention has been adopted by the Pennsylvania Railroad Company, and has the indorsement of the inspector of insurance patrol and electric lighting for the Philadelphia board of underwriters. Robert Johnson, 35 Congress street, is the Boston agent.

Guard Wires.—The West End Company are putting up three guard wires over the trolley wires in all localities where there is any danger of dead or other wires falling across the trolley wire. An iron wire about the size of that used for telephones is strung above the trolley wires on stays which are set about a foot and a half above the wire to be protected.

Essick Printing Telegraph.—The New England Company has been formed and negotiations are also pending for the establishment of southern and western companies. Messrs. R. D. Wilson & Co. report that applications have been made for forming foreign companies.

Underground Wires.—Conduits are being put in on Boylston street for the accommodation of the telephone wires of the N. E. Telephone and Telegraph Company.

The Standard Electric Company, of Vermont, have put in one of their 300 light machines for W. F. Badger, Albany and Wareham streets, Boston. The United States Cotton Company, of Central Falls, R. I., have just purchased a 1,300 light plant for their mills from the same company.

N. E. Railroad Club.—The club held its regular monthly meeting at the United States Hotel last Wednesday evening. The 75 members present were entertained with an address on "Railroad Signals," by Mr. R. H. Soule, of the Union Switch and Signal Company, of Pittsburgh. Mr. Soule was formerly general manager of the Erie road and, being fully conversant with his subject, gave a very able and interesting lecture. Mr. French, of the Old Colony road, also gave an account of the system of signals used by his road, saying that they were all operated by electricity using the rail circuit.

Springfield.—The board of aldermen, on December 12th, decided not to grant the Springfield street railway the right to use the single trolley system on its Forest Park extension until the aldermen of Lowell come to a decision regarding its use in that city, the latter having thoroughly investigated the system as in use in Cleveland and Cincinnati. Judge Gideon Wells, who is about to succeed John B. Stebbins as president of the Holyoke Water-Power Company, says that the company will erect a $100,000 electric light plant next year.

The Electric Club, of the Massachusetts Institute of Technology, held a very interesting meeting last Friday evening.

Mr. L. H. Rogers, general agent for New England for the Brush Electric Company, has sold a 600-light alternating plant to the Camden and Rockport Electric Light Company, of Camden, Maine. This is one of the new Brush-Pfannkuche alternaters, and is to be put in at once. The Ellsworth Electric Light and Power Company, Ellsworth, Maine, have also purchased a 600-light alternator from Mr. Rogers. A new station is to be erected, new machinery and construction work added, and the entire plant overhauled and put in first class condition. The company has been lighting the city successfully for some time with the Brush arc system.

S. L. C.

Boston, Dec. 16, 1889.

OUR CHICAGO LETTER.

Personal.—C. H. Cone has severed his connection with the Knapp Electrical Works.

Shay, Stephens & Co.'s new $15 insulator is quite a novelty in that line and is so constructed that perfect insulation is insured. The above company have closed contracts within the past 10 days for large sizes of glass insulators in numbers that will reach far into the thousands.

Sales.—The Mather Electric Company, J. H. Reid, manager, report the following sales closed the past week: Oshkosh Furniture Co., Oskosh, Wis., 150 incandescent; Northwestern Parlor Suit Co., Chicago, 150 incan-

descent, increase; Zangerlie Manufacturing Co., Chicago, 200 incandescent, increase; Pioneer Press, St. Paul, 200 incandescent, increase; Kent & Stuckfield, Denver, Colo., 50 incandescent. The Belding Motor Company report past week's sales as follows: J. S. Cahil, two horse-power; Lansing & McGarrigle, two horse-power; Whitewater Paper Co., 75-light dynamo; Reed Wrecking Co., Detroit, 40-light dynamo, small motors in the aggregate 10 horse-power in ¼, ½ and ⅓.

The Electrical Supply Company are now making a special insulation on their shield hand wire for use in packing houses and for use in running up sides of walls and in damp places. This wire is being used in large quantities by the Chicago Arc Light and Power Company in entering buildings from their underground conduits. Prominent among the new novelties placed on the market lately by this company is a new globe protector and the latest style of Wirt's standard voltmeter. The first is circular in shape and made of mica, it is made to fit the interior of the globe near the base and acts as a catch pan for dirt and dust as well as preventing the falling pieces of hot carbon from breaking the globe. The voltmeter is especially adapted for central station work and in cars as it cannot be thrown out of balance; it will reach from ½ volt to 250 and is guaranteed to be accurate.

D. B. D.

Chicago, Dec. 14, 1889.

OUR WASHINGTON LETTER.

Justice for Military Telegraph Operators.—The Society of the U. S. Military Telegraph Corps is taking active measures to secure the passage of a bill which has several times received favorable reports from Congressional military committees, with strong hopes of success. The bill grants no compensation to the war telegraphists, but provides that the Secretary of War may issue to each person entitled to it, a certificate of honorable service in the army. It has been endorsed by many prominent army officers, living and dead, and by the Grand Army of the Republic. The committee appointed to present the matter to Congress consists of W. J. Dealy and J. H. Emerick, of New York; E. Rosewater, Omaha; Wm. B. Wilson, Philadelphia, and L. C. Weir, Cincinnati. Mr. Rosewater is in Washington looking after the bill. A. G. Safford is also giving attention to it. The bill has been presented in both houses and referred to the respective military committees.

Edison's Photometer.—Of the large number of bills already introduced in Congress, a good percentage relate to subjects of special interest to REVIEW readers. This being the commencement of a long session, and of a new Congress, interested persons will have two years in which to urge their claims, and everybody comes forward with strong hopes that *this time* they must succeed. The powerful stream of eloquence has set in with a wastefulness that causes many regrets that Edison has not perfected his photometer, the invention of which was an inspiration that came to him while sitting in the gallery of the House of Representatives, where his imperfect hearing could just catch the roar of the babel of debate on the floor below. That was in 1878, when he came to Washington to exhibit his first phonograph to the Academy of Sciences and other official bodies. Under the lead of Uriah H. Painter and accompanied by his assistant, Charles Batchelor, who toted the 100-pound machine, refusing to let anybody touch it for fear it would get out of adjustment, he visited the White House, Patent Office, Smithsonian Institution and various other places, and finally dropped into the House gallery to watch the progress of legislation. Being unable to perceive any practical use for all the loud sound of talk, he immediately set to work devising a way of applying it to some good purpose. On the back of an old envelope he drew a sketch of a machine embracing a diaphragm, the vibrations of which operated some simple mechanism connected with a gimlet, which was shown as boring a hole through a board. A few days later a model of the invention was deposited in the patent office and, in due time, a patent was granted. A good many lobbyists would doubtless find much relief if a few of these machines, of large size, were in operation in the capitol.

Center Pole System.—The Commissioners say the Eckington and Soldiers' Home Street Railway has proved a very great success. Up to the present time no satisfactory underground electric railway system has been introduced, and of all the existing systems, the center pole system, such as is used by this company, which removes the conductors from the vicinity of trees and footways, is safest and most satisfactory. Wherever overhead wires are employed this arrangement should be insisted upon, both for safety and appearance, except when the carriageway has not sufficient width.

Any Other Power than Steam!—This is the characteristic clause in the charters of Washington street railways, too numerous to mention in detail, which Congress is asked to grant. The names of these roads, and of their most prominent incorporators, are the East Washington Railway, C. C. Duncanson; Washington and Highlands Railway, E. Kurtz Johnson; Suburban Railway, Charles E. Creecy; Georgetown and Arlington Railway, Samuel E. Wheatley; Georgetown Dock Railroad Company, John A. Baker. An application has been made to the Alexandria, Va., council for the privilege of building a street railway through any of the streets of the city, the motive power to be anything but steam.

Electric Roads Still Increasing.—The Glen Echo Railway Company, which has an office in the Sun Building, in Washington, is an organization to be chartered under the laws of Maryland, for the purpose of building a road from the northern terminal of the T.-H. Tennallytown road, now in process of consruction, to the location of a projected suburban town on the banks of the Potomac, six miles from Washington. The length of the line will be about three miles with no grade over five per cent. Right of way has been obtained and it is expected work will be commenced during the winter. The managers have not decided what motive power to use, but will give advocates of electricity a hearing.

The Western Electric Company has commenced suit against Joseph U. Burket & Company, of Washington, D. C., for alleged infringement of patents Nos. 148,447 to Augustus Hall, dated March 10, 1874, and 172,993 to Elisha Gray, March 1, 1876. The former covers the sliding contact and the latter the flexible cable for electrical connection with a moving elevator cab. Royce & Marean, the Western Union Telegraph managers, are agents for the Western Electric Company. It is understood that they claim a royalty on account of the patentees, and also insists that all annunciators used in elevators shall be purchased from them.

The Corcoran Art Gallery, in Washington, is about substituting incandescent lamps for gas. Seven hundred lamps will be maintained by current from the city lighting station. Royce & Marean have the contract for wiring the building and supplying fixtures and reflectors. The same firm has just finished wiring the Arlington Hotel for 1,100 lights.

G. C. M.

Washington, D. C., Dec. 13th.

ELECTRICAL NEWS FROM GEORGIA.

The Georgia Electric Light Company of this city G. H. Wade, superintendent, have just completed a new building in addition to their works, with well equipped test and stock rooms, and general store house. All damage on station caused by recent fire has been repaired.

The Gate City Electrical Supply and Construction Company, J. B. Hollis, manager, has been recently organized, with strong local backing. They propose to carry a full line of electrical goods, also do all kinds of general electrical work. Especial attention will be given to the establishment of isolated electric light plants.

W. R. Polk, Jr., electrician, received medals at the late Piedmont Exposition, held in Atlanta, for general electrical display. Mr. Polk has recently been allowed patents for new style storage battery, which will be used in connection with one of the new street railways here.

December 2d, Americus, Ga., was lighted by electricity for the first time, and the city is jubilant in consequence. Forty arc lights of 1,250 candle-power each are furnished.

Atlanta, Ga., Dec. 4th, 1889. F. E. C.

Death of M. W. Goodyear.

Miles Watt Goodyear, one of the best known electrical men of this city, died suddenly of heart disease, Sunday of this week. Mr. Goodyear had been a sufferer from poor health for a few months past, but none of his friends expected such a sudden ending of a life that had always been so vigorous.

Mr. Goodyear had been for over 20 years connected with electrical work and electrical manufacture, commencing with L. G. Tillotson & Company, and remaining with the company when it was changed to The E. S. Greeley & Company, as manager of the electrical department. The deceased leaves a widow, and a daughter aged 19. There will be universal regret in electrical circles over the untimely death of Mr. Goodyear, who was universally liked and numbered his friends by the score.

Mr. Goodyear was about 50 years of age, was prominent in Masonic circles, and was one of the founders of the Electric Club, being a member of the Board of Managers of the Club since its organization in 1886.

Mr. C. Lambdin, ex-manager of the Wilmington, N. C., Telephone Exchange, has now charge of the telephonic interests of the Island of Jamaica. The Kingston, Jamaica, Exchange is increasing rapidly under his management, and is flourishing accordingly. Since he took charge, 18 months ago, the increase has been nearly 50 per cent., and the good work still goes on.

The Wire Question in Boston.

Mr. S. E. Barton, chairman of the Electric Lighting Committee of the New England Insurance Exchange, in a recent article in the Boston *Herald*, written immediately after the great Boston fire, takes a strong stand in opposition to the hue and cry in favor of burying all electric wires. The writer evidently does not think that electricity caused the Boston fire, and then proceeds to describe at some length the various safety devices which are well known, but which are not always used in the construction of electric light systems.

Mr. Barton concludes as follows: "There is no reasonable excuse for not adopting this precaution and preventive, not only in Boston but in every place where light and heavy currents are employed. A very ingenious and convenient safety device of this sort can be seen and procured, and were they to be universally adopted, as they should be, a large variety would doubtless be manufactured.

"Electric lighting interests have, almost without exception, cheerfully followed our rules, and in many cases urged us to adopt more stringent ones. When the outside of the building is reached the underwriter's control stops, because he can only control by withholding his consent for the use of any device until it is acceptably installed and inspected by him. Consequently the authorities who have the power to regulate such matters should act, if not alone, certainly in co-operation with fire underwriters. If some such co-operation on the part of the authorities, and less cry of 'bury the wires' on the part of the general public, and those who have in special charge the welfare of the public had prevailed, there would be a safer condition of things existing to-day.

"Of all of nature's forces with which we are blessed there is not one whose laws are more precise or better understood than those of electricity. There is no natural force so capable of control, and none is more useful than electricity is destined to be. It is then, indeed, a shameful pity to see such a blessing working distrust, fear and disaster through careless, unskillful and inexcusable handling. The past has been excusable through lack of knowledge of the science, and by reason of its very rapid development; but defective work should no longer be tolerated, and existing defects should at once be removed."

A Case of Euphony.

The Detroit *Free Press* prints an interview with a local electrician, in which the gentleman indulges in a criticism of Mr. Edison's recent magazine article decrying the use of high tension currents. This is all right. Detroit's electricians have as much right to express themselves as Mr. Edison has, but this particular one must have been astonished when he woke up in the morning and found he had been telling all about "hypotential" currents.—*Western Fireman.*

The interest in electric protectors, as they are termed, is on the increase. A number of recent inventions in this field are announced. The electrical industry generally will be interested in an article by Mr. J. E. Crandall, electrician of the Chesapeake and Potomac Telephone Company, which appears in another part of this paper, and which gives his experience with a strong current protector.

Admiral Walker, who is now the flag officer of the European squadron, says, in his last report as chief of the Bureau of Navigation, that at an early date the Bureau interested itself in the subject of introducing electrical appliances, and especially incandescent lighting on shipboard. In 1882 a trial lighting plant was installed on the "Trenton," which was the first man-of-war in the world to be lighted by electricity. When she was re-commissioned last this plant was put in thorough order, and was so successful that light was furnished by it up to the time of her destruction at Samoa, on the 16th of March last, the dynamo having stopped only when steam failed. Commander Bradford superintended this installation and has been identified with all work of this character since. Under his instruction and control a number of young officers have been trained in all the practical details of installation on board ship, the result being that there is now a small corps of naval experts in this important branch of equipment.

PERSONAL.

Mr. C. A. Gates, of Massilon, Ohio, was a New York visitor last week, and reports the demand for the Russell engine very large.

Mr. A. G. Davis, president of the Viaduct Manufacturing Company, and one of the pioneers in telephone and other electrical work, visited New York last week, and gave the REVIEW a pleasant call.

Mr. J. D. Easterlin, of Charleston, S. C., superintendent of the Southern Bell Telephone Company, was in New York last week singing the praises of the South and of the telephone business in that section.

Mr. Walter T. Glover, of London, Eng., who has been a visitor in the United States for several weeks, sailed for home last Saturday. Mr. Glover is a member of the firm of W. T. Glover & Co., the wire and cable manufacturers of Manchester.

Mr. J. E. Powell, superintendent of the Treasury Department's Electric Lighting Bureau, has been requested by the Civil Service Commission to serve on the board to examine applicants for positions as engineers of lighting plants, etc., but is unable to accept on account of the multiplicity of duties pressing upon him in his own department.

Mr. James F. Kelly, of the Edison Machine Works, New York, has been appointed agent for the United States for the new Edison battery. This improved battery, of which mention was made in the ELECTRICAL REVIEW a few weeks ago, is being exhaustively tested at Mr. Edison's laboratory at Orange, N. J., the result of which will be announced at an early day.

Mr. James English, of New Haven, who is interested in several of the leading electric light companies of New England and who runs a model station in his own city, was a visitor at the metropolis last week. In addition to running a very complete electric lighting plant, Mr. English has the satisfaction of doing business in as pleasant and convenient electric lighting offices as the industry can show.

—— The Fourth avenue electric line of Minneapolis, Minn., is rapidly nearing completion, and the construction is in such condition that upon the arrival of the trolleys, which are expected daily, the line can be put in running order almost at once.

—— The Edison General Electric Company has declared a quarterly dividend of two per cent. on stock (except such stock as is held in trust by Farmers' Loan and Trust Company), payable January 3d, to stockholders of record December 30th; books close December 20th, re-open January 4th.

—— A. E. Kennelly, of Edison's laboratory, who has so frequently been called as an expert in important litigations, will contribute to the January *Scribner's* the sixth article in the electric series, entitled "Electricity in the Household," which is a popular discussion of the numerous devices that can be conveniently applied to every modern home where comfort is aimed at. The article will be illustrated.

—— The Roman Catholic Church of the Holy Innocents, New York, of which the Rev. John Larkin is pastor, was brilliantly illuminated last Sunday by electricity. Mr. P. D. Columbani, an electrician, who is a member of the church, originated the idea and superintended the construction of the reflectors and lights. Along the borders of the large painting over the altar of the Crucifixion ran a row of 160 electric lights. Electric lights hidden in shades illuminated the altars, and clusters of lights in electroliers formed halos over the statues of St. Patrick and St. Bridget in the galleries. There were also two electroliers with clusters of the lily lights suspended over the altar. Each chandelier was formed with a cross above the lights and a crown above the cross. The crowns were studded with gems that were also illuminated.

Telephonic News

*** The business people of Dunnings and Moscow, Pa., are agitating the extension of telephone lines from Scranton to their towns.

*** The ELECTRICAL REVIEW (illustrated), published in New York, is one of the most valuable class papers in the country. It is filled with statistics relative to electricity, treats every subject handled intelligently, and contains a vast amount of interesting information on the subject.—*Ry. Service Gazette.*

*** The telephone line from Salt Lake City has been completed to Logan, and within a few days the line will be finished to Franklin, Idaho, which will give the telephone company a line extending 215 miles, the terminal points being Franklin, Idaho and Nephi, Utah. Successful conversation is carried on between Logan and Payson, a distance of 160 miles.

*** Manager Boynton, of the Meadville (Pa.) Telephone Exchange, has received 2,000 pounds of hard drawn copper wire with which to put up a trunk line—that is in telephone circles a line without intermediate stations—from Erie to Meadville. Meadville is also connected with Oil City, by copper wire, and the latter place with Titusville; thus quite a circuit has been established.

*** The Commercial Telephone Company has men at work in the upper part of Lansingburg, N. Y., improving the service by removing the lines to the river bank, where they will be some distance from the electric railroad wires. It is believed that by this means induction will be to a great extent avoided. Superintendent Seeley states that he will do all in his power to improve the service in the village. The trunk lines between Lansingburg and Troy will be run with a metallic circuit.

*** Mr. Jerome Prince, of Milford, has lately been granted a patent on a new telephone of his own invention. His invention consists in the transmission of sound by the vibration of glass, and his attention was directed to the subject in a peculiar way. While waiting in Boston one day he chanced to wander into one of the dime museums, and as he entered he observed a young girl playing a tune on tumblers, each tumbler being partially filled with water. Mr. Prince instantly thought if the vibration of glass can be made to give forth such varied and musical sounds by the manipulations before him, why can not this vibration of glass be brought to some practical utility, and with these thoughts and expectations he set to work. The new telephone consists of a diaphragm or transmitter of simple glass resting on a number of glass rods, and these communicating with an ordinary wire. The line in operation at Milford extends from a grocery on Main street to the residence of one of the proprietors, a distance perhaps of some 30 rods, passing some five or six sharp angles before reaching its destination. Over this wire the ticking of a watch can be distinctly heard, and whispered conversation carried on with no difficulty whatever. The distance that sound can be transmitted with the new telephone varies according to the thickness of the glass transmitter. The one in consideration allows a whispered conversation three miles, and by using a thicker glass a much longer distance. It makes no difference how many angles the wire takes in reaching its destination, the sound is transmitted just as readily. Another peculiarity of the invention is the increased intensity of the sound that is transmitted. Each vibration seems to gather strength and force from the vibrations behind it, and when the sound reaches the ear of the auditor it is wonderfully clear and distinct. The transmission of these sounds without the aid of electricity would seem to be dependent upon principles not hitherto well understood.—*Boston Herald.*

TELEPHONE VS. RAILWAY.

SOME OF THE PROCEEDINGS IN THE INTERESTING TEST CASE NOW BEING TRIED AT CINCINNATI.

TO THE EDITOR OF ELECTRICAL REVIEW:

Do the single "trolley wires" from which the electric railways derive their motive power affect the good working of the telephones? This question is one open to considerable dispute, and when a final decision is reached, one of two great branches of the electrical industries will suffer. The telephone companies have been, and are, making considerable trouble for the street railway companies all over the country. The manner in which a question of such portent as this is generally decided is by the verdict obtained in a test case, to which both sides give time, money and great attention until the very end.

Such a case is now in progress at Cincinnati, and from the able counsel which both sides have retained, and the vast array of witnesses, including Boston and New York experts, which are being put upon the stand, it seems probable that the matter will be pushed to its limits, and that the verdict given will be final and cited as an authority.

The case is attracting the attention of electricians all over the United States, as well as capitalists who look to both these branches of the electrical industry for investment. It is an action of the Cincinnati and Suburban Telegraph and Telephone Association, brought against the Mt. Auburn Electric Street Railway Company, and is an attack against the "single trolley system," which, as claimed by the telephone association, results seriously to the operation of its wires. The single trolley system is at present in use by the electric railway company. The telephone people claim that the double trolley system does not interfere with the operation of the telephone lines, and were this system used by the Mt. Auburn Company the trouble now existing with the telephones would be obviated.

The proceedings have been attended by a large crowd of people, including many leading attorneys and a number of capitalists. The case is strictly an electrical one, involving all the intricacies of electricity, and many fine points will be developed by the experts who are to testify.

In opening the case the counsel for the plaintiffs presented a petition praying for an injunction against the further operation of the Mt. Auburn electric railway under its present single trolley system. The telephone company had placed lines on all the streets now used by the electric railway, under grants obtained from the State. Last June, when the railway company began to operate the electric road, there commenced a buzzing noise on the telephone lines along the route of the road.

The noise was so loud and continuous that it became injurious to the service of the telephones, and in a great many cases destructible to their use. Much of the trouble is due to induction, and not a little to the single trolley system, for which a return current is created by transmitting the current from the wire to the motors under the car and thence to the rails. Thus a leakage is caused, interfering with the wires of the telephone company. Counsel expected to show that the double trolley system obviated this difficulty. The telephone company had the right to enjoin the use of the single trolley system, and so petitioned.

The answer of the defendant stated that the earth was a limitless reservoir of electricity, and that it was the proper conducting ground of electricity. The defendant depended upon it for its return current in operating its cars, and disputed the claim of the plaintiff that it interfered with the operation of the telepone lines. The answer was a general denial of the cause of trouble to the telephone company, as set out in the plaintiff's petition.

A number of witnesses owning telephones along the line of the electric railway gave testimony as to the buzzing noise; that it was not noticed before the cars were put in operation, and that the telephones worked all right after 12 o'clock at night, when the cars stopped running. The first of the experts was the superintendent of the telephone company, who said it was his business to superintend the construction of the lines, and a general supervision of the instruments and hear complaints. In a general way he was familiar with the routes of the wires. The witness described the routes of the different lines on which the trouble exists and the distance each line runs parallel with the electric road. "I have tested all these lines and I find there is a noise produced by the electric road. At times it is impossible to use the telephones, as they are affected by induction. There is a buzzing sound on the telephone, at times very loud, and also on every wire that runs parallel with the electric road. The longer lines are in trouble more than the shorter ones, and there are in the neighborhood of 200 lines affected. Prior to the operation of the electric road we had no complaint against the electrical service. Lines not affected by the road are giving good satisfaction. All these lines are grounded circuits, and there are no metallic circuits in this city. I have never seen an exchange operated entirely by the metallic circuit." The witness described a series of experiments he had performed on lines running parallel with the electric road, and ascertained that the road was the cause of the trouble. The current arising from the trolley wires frequently communicated to the telephone line and rang the bell of the subscriber, as well as causing the annunciator in the exchange to drop. In this way the operator and subscriber were both called when no call had been made by either.

On cross-examination the witness was asked what a telephone was. He described the instrument, its construction, how the electricity is applied, and revealed comprehensive information on the subject, demonstrating his ability not only to perform his duties, but also to assume the role of an expert witness. Efforts to confound the witness on the general subject of electricity were not a success.

A Mr. Lockwood was sworn and said: "I reside in Boston, Mass., and am an electrician. In the performance of my duties I have paid very great attention to the workings of electric street railways and the troubles to telephone lines arising therefrom." Witness described the construction of the four different kinds of electric railways. Where the double trolley overhead system has been used, no trouble has ever been experienced by telephone subscribers on parallel lines, but in all parts of the United States where the single trolley overhead system has been introduced there has been noise produced on the adjacent telephone lines. The noise is due to an electric current which escapes from the trolley wire, and more especially from the rail. Witness said the expense of changing the Mt. Auburn electric railway from a single to a double trolley system would be comparatively insignificant.

The efficacy of the McClure telephone line device, the witness said, depended on conditions, in some places being more effective than in others, just as there are local differences as to leakage. "I have examined the telephones along the Mt. Auburn electric railway line, and can testify that the McClure device would not eliminate the difficulty. Generally speaking, it might remedy it to the extent of abating one-half the noise."

C.

Cincinnati, Ohio, Dec. 12th.

*** An important telephone case which has been in interference in the patent office for two years, between Rosebrugh, Carty and Barrett, has been decided in favor of Rosebrugh. The invention relates to duplexing metallic telephone circuits, and is expected to materially reduce the cost of long-distance telephoning.

*** The Missouri-Kansas Telephone Company is making arrangements to give the consolidated city the benefit of a number of valuable improvements in its telephone service. The city bridges across the Kaw are laden with wires and the company has decided to place a cable of 100 wires under the bed of the river. It is also probable that the wires will be placed underground east of the river.

Lightning Arresters.

TO THE EDITOR OF ELECTRICAL REVIEW:

The question of protecting telephones and cable conductors from heavy and dangerous electric currents is one of increasing importance. It is now no uncommon thing to read in the daily papers of serious and extensive damage resulting from electric storms, or from the crossing of telephone wires with electric light wires. In every case the damage might have been averted by the proper and thorough protection of the conductor leading into the exchange, or house affected, and, in many cases, thousands of dollars would have been saved.

The subject of lightning arresters is a much debated one, nearly every company possessing some arrester device of its own, while those who have no safe guards against currents of high E. M. F. are unable to definitely decide what is best to use.

It is self-evident that some form of protection should be arranged at each end of the line. It is just as important to protect the subscriber's end of the line as the exchange end.

A wire connecting an instrument in a subscriber's residence, or place of business, in an electric light district, may become crossed at any time with an electric light wire, and, if but one end of the line is protected, and that the exchange end, serious trouble at the subscriber's end of the line is still liable to result.

Considering the fact that electric light plants are rapidly growing, and that each wire added to their systems is one additional menace of danger to telephone exchanges and telephone subscribers, it becomes of immediate importance to provide some effective means of protection against the dangers which beset us on every hand.

The Chesapeake and Potomac Telephone Company, of Washington, D. C., is at present using an automatic protector in the cable boxes at its cable poles.

These protectors took the place of fusible wires, which were previously used entirely by this company, but were discarded for the reason that, while thoroughly protecting the conductors against currents of high E. M. F., they failed to afford protection from currents of low tension, as the incandescent. Besides this, protection from a current of high E. M. F., by means of fusible wire, means destruction of the wire and the necessity of replacing it in numerous cases after every lightning storm; a work of considerable magnitude where the points protected number many thousands, and where the protecting fusible wires are liable to be destroyed twice, or even three or four times, in the course of 24 hours, as is the case in all localities subject to lightning storms.

The above objections to the use of fusible wire apply with equal force to the use of tin foil, as well as to any and all fusible substances used as means of protection against electric currents of high E. M. F.

During the summer of 1888, an unusually large number of lightning storms visited Washington and, as a consequence, a great number of instruments were burned out; but notwithstanding this fact, lightning is less dangerous to telephone exchanges and telephonic apparatus than electric light currents of either great or medium intensity. The arc current has destroyed a large number of instruments in Washington, but, on account of its very high E. M. F., the fusible wires at the cable boxes have, with three exceptions, kept it out of the exchange. In all cases, however, it has burned out every instrument on the line.

The current which at present causes the most trouble is the incandescent, and in every case the fusible wire has failed to burn out, thus allowing the current to enter the exchange. It is a very difficult matter to determine the exact size of wire, or the kind of material that will fuse with currents of low or medium intensity.

A current of this character, on a wire crossed with a telephone wire, does its work slowly but surely, and should properly be regarded as the most dangerous current of all, for the reason that it will gradually heat the core of the spool and wire for a long time before burning out the annunciator or

telephone, and is thus liable to complete its incendiary work ere it can be detected and gotten under control.

Evidently the proper and effective thing to use as a protector is some efficient automatic device, arranged with an armature and an electro-magnet, which will respond not only to currents of great intensity, but as well to the small or "sneak" currents.

A protector, other than an automatic one, would be just as troublesome to look after as fusible wire or tin foil, and the delays caused by readjusting it when burned out would be vexatious to the subscribers and difficult to satisfactorily explain.

An automatic device: one which is so constructed as to operate (with say $\frac{5}{10}$ to $\frac{7}{10}$ of an ampere as the minimum, and which will carry six to eight amperes without sustaining injury), so as to ground the electric charge and open the line or instrument, will prove an efficient protector against lightning and electric currents of every kind. A dangerous electric current should, of course, be conducted to the ground as soon as possible, and through as little resistance as possible, and if the current carried by the wire with which the telephone line is crossed happens to be too strong for the carrying capacity of the conductor with which the protector is wound, it is safer to have the protector burn out than to have it wound with a large conductor arranged as a shunt to stand a dangerous current, one which would hold it in a building for, perhaps, hours. If the conductor of the protector burns out, the worst has been done, and the telephone instrument is still in a safe condition.

A protector wound to stand a current of six or eight amperes, will not burn out from the ordinary leaks which we often get from the electric light currents, and a direct cross with both poles of the machine seldom occurs.

Finally, it is ever well to bear in mind that it takes but the smallest amount of current to injure a telephone.

J. E. CRANDALL.

Washington, D. C., Dec. 10th, '89.

Electric Wires.

[From the Bridgeport *Standard*.]

It is gratifying to see the electrical press taking hold of the deadly wire question with some degree of sympathy and justice for the people who run the risk of death by advanced electrical progress. The ELECTRICAL REVIEW has an article on "The High Tension Wire Question" which shows that those most deeply interested in the use of electricity as a servant to mankind, are not callous to the alarmed cries of public opinion pointed by such frightful accidents as the death of lineman Feeks.

The ELECTRICAL REVIEW says, for instance, that "the injury to human life in large cities, but especially in New York, from electric light wires, is a subject which should receive immediate attention on the part of all those who wish for the prosperity of the electric light industry, for the reason that in the first place there are more accidents than there should be, and in the second place, a large portion of the electric light business is rapidly being misrepresented before the general public, which is becoming prejudiced against it."

The REVIEW admits that there have been failures to employ every precaution by some companies, while others have been faithful to the public interest. It begs the public to remember that there are two sides to the question, although the remembrance of Feeks hanging on the wires in mid-air makes but one side visible to the public eye. "The question of the hour is," continues the REVIEW, "what to do with the condition of things as it exists now? Insulated wires, like everything else in this world, become dilapidated in time. A vast number of those hanging over the streets and housetops of New York to-day are in bad condition; so are many telegraph, telephone and all sorts of iron wires. It is wasting valuable time to try and find out which are the worst. It is equally foolish to cut wires down by the wholesale. Undoubtedly his honor, Mayor Grant, is much irritated by the apparent lack of progress which is being made, but it is as useless for him to tell Electrical Expert Wheeler that he is responsible for this loss of life as it would be for that at present much over-worked gentleman to try to personally inspect every wire in this great city."

We are sorry to see that the writer does not believe in putting all the wires of whatever character, now strung overhead, into subways. He says:

"We do not think the burial of the strong current wires will decrease the danger. It is probable that the remedy that would come the nearest to removing the element of danger, considering that alone, is the burial of all the wires except those carrying high tension currents. Let these remain in sight where their condition could be easily and constantly inspected. This would reduce the overhead wires probably 80 per cent., and the likelihood of the numberless telephone, telegraph, messenger call, fire alarm wires, etc., coming in contact with a dangerous electric current and distributing it in unexpected places, will disappear."

We do not believe that the public will be satisfied with even 20 per cent. of the wires overhead. Subways can be constructed to meet all the suggestions of the above extract as to interference of wires. The question of expense is not to be considered. The electric light companies should gracefully yield to the pressure of public opinion and prepare their future operations with a view to using subways entirely for wires of all description. If the work of examination and reform is carried on in the spirit of the closing words of this article which we quote, a remedy will speedily be found:

"The whole question is one deserving of careful, intelligent consideration, and while the two sad deaths of linemen last week, one of which was particularly horrible, has greatly stirred up the public mind in this city, we trust wise counsel will prevail, and the suppliers of electric light and the users of electric light will find that they both desire the same end—the electric light at the minimum of danger and of expense."

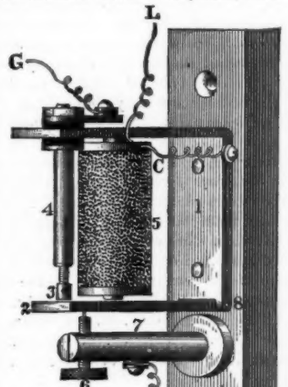
He Failed to Obey Orders.

E. H. Kramer, a telegraph operator at a block station near the navy yard tunnel in Washington, D. C., was held by the coroner's jury on account of his connection with a collision at that place on September 13, in which the engineer of an express train was instantly killed, but the grand jury, after a most thorough investigation of the case, ignored the charge and failed to bring in an indictment against him. A few hours before the collision occurred the south-bound track was obstructed by some slight accident to a work train, and trains moving in both directions were using the north-bound track under telegraphic orders from the despatcher at Wilmington, Del. Operator Kramer was directed to hold all north-bound trains for orders, and subsequently received special orders to pass several trains, all of which he properly executed. A little later, learning that the obstructed track was clear, he assumed that the despatcher would send no more trains south on the north-bound track, and let a freight train go, contrary to the holding order which had not been revoked. Much sympathy for Kramer and much surprise at the conclusion of the grand jury have been manifested. The result is apparently owing to the fact that, in every dozen of men, there is almost certain to be at least one imbued with a feeling of intense hostility to great corporations and a determination to put all possible responsibilities on them.

The occurence of this accident renews and emphasizes one or two questions concerning railroad telegraphy that have heretofore been asked: First, whether double-track roads, running trains by block system, are prepared to quickly and safely return to simple, old-fashioned, single-track despatching; second, whether all the responsibility of changing switches, handling signals and doing the rapid telegraphing required in such emergencies, should be placed upon boys who may possess neither experience in railroading nor skill as telegraph operators, especially while, according to President Norvin Green, over 10,000 railroad operators are compelled, with little or no compensation, to transact commercial business, which is likely to be heaviest when delayed trains need most attention. It would be easy to prove that neither telegraph rates nor operators' salaries are high enough.

The Crandall Automatic Protector.

This protector is in successful use at Washington and Baltimore. The illustration is explained by letters and figures, the letters showing the normal and abnormal circuits through the protector. *L* is outside end of wire of coil connecting line wire. *C* is inside end of coil fastened to heel iron, which conducts currents to the armature. *I-CC* (instrument or cable conductor) is the connection between armature and *C* when in normal condition. *G* shows connection between armature and ground when in abnormal condition, which action of the armature conducts the excessive current or charge to the ground direct, leaving instrument or cable conductor open during continuance of said excessive current. After the excessive current has passed, the armature, operated by gravity, re establishes contact between *C* and *I-CC* through the armature. The numbers signify the following:



THE CRANDALL LIGHTNING ARRESTER.

1—Bent iron bar.
2—Armature.
3—Adjusting screw between armature and ground post.
4—Metal post to which ground wire is attached and is insulated from heel iron to which spool is fastened.
5—Spool which is wound with 5-10 ohm resistance.
6—Adjusting-screw between *I-CC* and armature.
7—Metal post to which is fastened conductor to *I-CC*.
8—Connection between armature and bent iron bar.

The base is of vulcanized fiber.

High Speed Telegraphy.

Although the Americans are entitled to claim the telephone as their invention, it will not be out of place to mention that the automatic high speed instrument, which is unapproachable for the amount of work it can dispose of to groups of offices simultaneously, is the invention of our countryman, Sir Charles Wheatstone. It may be of local interest to note that the working model of his first experimental instrument was sent from his workshop to be tried between Newcastle and London, somewhere about the year 1868. It was very carefully nursed, as it was clear it possessed the germs of an instrument that would at once double the carrying capacity of the wires. There was much jubilation when a speed of 80 words a minute was secured. Since then its carrying capacity, by successive mechanical and electrical improvements, has gone up even on the longest lines to 400 words a minute, at which rate London is daily supplying Newcastle, Edinburgh, Glasgow, Dundee and Aberdeen simultaneously with their news despatches. Locally it is, we understand, employed to supply North and South Shields, Sunderland, Middlesbrough, Darlington, West Hartlepool, etc., with their news items at a minimum rate of 375 words a minute. After the patent rights of Sir Charles Wheatstone (and his executors) expired, the automatic system was adopted by the Western Union Telegraph Company, of America, and Mr. Finn, a clever electrician employed in the Newcastle Post Office, was selected to establish the working of the system on that company's lines, his headquarters being fixed at Buffalo, where he now holds a distinguished position.—*Chronicle* (Newcastle, England.)

TELEGRAPHIC

.... The Volta Graphophone Company, Washington, D. C., was awarded at Paris a gold medal for the graphophone invented by Mr. Tainter.

.... The argument in the great Northwestern Telegraph Company against the Montreal Telegraph Company, at Montreal, is concluded. Justice Everitcle congratulated the counsel on the ability they displayed in the conduct of the case, took it on deliber and promised judgment in a few days.

.... For a long time since the Russians have made great efforts to obtain a concession for the construction of a telegraph line between Kiakhta, in Southern Siberia, and Pekin, and recently they thought they had been successful. The Chinese Government seems, however, to have changed its mind unexpectedly, and it is now asserted on good authority that China has definitely resolved to grant no such concession.

.... Superintendent Morris Mead, of the city bureau of electricity, Pittsburgh, Pa., is completing a system of signals whereby the entire police force can be instantly notified of an alarm. The signals consist of a flash of light at night and semaphore arms for use during the day. One of these signals will be erected in a few days at the corner of Seventh street and Duquesne way, where it will be given a practical test. By the use of this system it will greatly lessen the chances for the escape of people who desire to leave the city after committing crime.

.... A number of pretty girls in line waiting their turn to kiss an old gray-haired man is not an every-day sight, yet that is what might have been seen by any one who was at the Western Union Telegraph office, at Dey street and Broadway, a few days since. The man who received this remarkable honor was James D. Reed, the newly appointed consul to Dumfries, Scotland. Nor was this the only honor the old man received. The male employés of the Western Union Company presented him with a handsome gold medallion, upon which his services to the world in general were set forth. And now it is said that when he arrives on the other side the British telegraphers will give him a grand reception.

Interstate Commerce Regulations for Telegraph Companies.

Senate bill 208, introduced by John C. Spooner, of Wisconsin, and referred to the Committee on Interstate Commerce, proposes to place all telegraph companies, whose business is not confined to the limits of one State, in substantially the same position before the Interstate Commerce Commission as that occupied by the railroads.

It prohibits the companies from granting any favors or making any special rates to its patrons and from making combinations with competing lines to share their earnings. It stipulates that no company shall discriminate between the publishers of newspapers by allowing terms or advantages to one or more newspapers for a like and contemporaneous service which are not allowed to other newspapers in any city, town or place where there is a telegraph office from which such messages may be dropped. The commission is given jurisdiction over telegraph companies with authority to require the production of all books, papers, contracts and documents and to obtain full information necessary to perform its duties. The companies are required to submit annual reports showing in detail the amount of capital stock issued, the amounts paid therefor, and the manner of payment for the same; dividends paid, surplus, indebtedness, cost of franchises and plant, number of employés and salaries paid, earnings and expenses, profit and loss, etc.

* * The Clark carriage works, at Oshkosh, Wis., are now illuminated with 100 incandescent electric lights and 50 more will be put in.

* * The Edgerton Manufacturing Company, of Philadelphia, engaged in the production of steam engines, electric motors, etc., will remove its plant to Lansdale, Pa.

* * A new letter stamping machine has been put on trial in the Philadelphia post office. It is run by electricity, will cancel about 25,000 letters an hour, and has a register that keeps count of each letter stamped. This machine may do away with the services of a few stampers.

* * The electric plant at Sumter, S. C., consists of a 35-light 2,000 candle-power Waterhouse and a 500 light alternating incandescent Westinghouse. A 35 horse-power and a 50 horse-power Westinghouse Junior furnish power. Although the plant has been in operation only one month, all the incandescent lights are taken. The contract with the town is for 10 years for 30 arcs, at $3,500 per year.

* * The new electric company, the Citizens' Gas Light and Heating Company, Bloomington, Ill., have purchased a 150-horse-power Hamilton Corliss engine, and will push the work on their plant to completion as rapidly as possibe. They will use the Westinghouse system, as will also the Chicago and Alton, who are about to introduce 1,000 incandescent lamps in their general shops in Bloomington.

* * A storage battery street car was run for the first time in Cleveland, Ohio, by Assistant Superintendent Duty, of the West Side Railway Company, a few evenings ago. The officers of the road and a number of their friends boarded the new car at the company's barn on Lorain street and enjoyed a ride without accident to the Public Square and return. Everybody on the car, as well as those along the route, were well pleased with the appearance, easy motion and noiseless running of the car.

* * The new electric light engine and boiler arrived in Boulder, Colo., a few days ago, after being some three weeks on the road. The boiler is 16 feet long by five feet six inches in diameter and has 98 flues; 100 horse-power Ball engine with automatic governor. This machinery will be placed in position as quick as possible and cables attached to relieve the old plant now supplying the city with light. The new plant is very fine, and a more brilliant light may be expected when set in operation.

* * A young electrician of Omaha has a very ingenious way of killing rats. The rodent is caught in an ordinary oval trap, the bottom of which is covered with tin. One wire connected with a dynamo is fastened to the tin lining of the trap, and another is thrust into the prisoner's cell. The well-known propensity of a caged rat to do battle asserts itself, and he seizes the wire between his teeth. In doing so he makes the mistake of his life. The circuit is completed, his jaws close on the wire with a death grip, and without a squeak, and almost without a quiver, he passes into a state of eternal desuetude.

* * The Consolidated Municipal Electric Light Co., of St. Louis, will come into existence on January 1, or as shortly thereafter as is possible for certain changes involved by the birth of this new illuminating organization to be made. These changes are necessary steps to be taken whereby the United Electric Light Co., of St. Louis, the St. Louis Illuminating Co. and the Municipal Electric Light Co. unite their forces to form an almost complete consolidation of the electric light companies of that city, and their union under the name of the Consolidated Municipal will represent the final culmination of the many negotiations that have been in progress during the past year.

New Edison-Sprague Offices in Chicago.

The Edison-Sprague offices in the Rialto building, Chicago, have been handsomely furnished throughout and will be the headquarters of the western business of these companies. Both concerns recently removed from the Rookery, where they found their old quarters inadequate to the demands of their business. Their present quarters are on the ground floor of the Rialto, the main entrance on Van Buren street, opposite the Lake Shore depot, while there is another leading from the main corridor of the building. The floor space in these offices exceed 6,000 feet, one-fourth of the space on the main floor of the building.

At the main entrance on Van Buren street are the general offices of the Sprague Equipment Company; to the left and directly opposite, the stationary motor department, in charge of C. M. Barclay. Further down the corridor, to the left, is the engineering department of the Sprague Company, and next to this the private office of J. L. Barclay, and the desks occupied by the agents in the railway department. About the center of the row of offices is that of H. McL. Harding, general agent of the Sprague Company, who will give his personal attention to the electric mining department. Across the corridor is the engineering department of the Edison Company, while at his left is the private office of F. B. Badt, who is in charge of the construction and engineering department. The north end is occupied by the private office of C. C. Warren, manager of the western department of the Edison Company, and the general offices of that concern.

Edison dynamos and Sprague motors will be displayed in conspicuous places and shown in operation. Electrical devices of all kinds handled by these companies may be found at these offices. In addition to the space occupied for offices and sales rooms there are 10,000 square feet in the basement devoted to store rooms and repair shops. A large number of men are employed here, and it is the intention of the companies to do all their western work in Chicago. The Edison Company have their dynamos, switchboards, etc., in operation here, and the Sprague Company are building a track on which they will operate a car illustrating the features of their street railroad system.

The wonderful growth of the electrical interests in the west is well illustrated in the development of these companies. Since Mr. Warren assumed his present position he has contracts to install 42 plants aggregating about 25,000 lamps. Mr. Warren was an extremely successful manager when he represented the United States Electric Lighting Company in Chicago, and the figures just given would seem to indicate that he will be no less successful in his new position.

Electric lighting is a growing business, and it requires just such enterprising, vigorous men as Mr. Warren to handle it in the west.

H. McL. Harding, the general agent of the Sprague Company, has been with that corporation since its organization. He will make Chicago his home, devoting himself to the development of the mining and irrigation department. In relation to the other departments of this field it may be said that the Sprague Company has 50 offices in the United States and 1,500 workmen, employed day and night, manufacturing electrical machinery.

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* * The Eastern Manufacturing Company will light their mill in South Brewer, Me., by electricity and will use the Thomson-Houston. The dynamo has just been put in place and the other necessary work is being done. It has a capacity of 150 incandescent lights, and 124 will be used at first. Good progress is being made on the work of constructing the mill buildings.

* * Additions are being made to the plant of the Calgary Electric Light Company, Winnepeg, Manitoba, Canada, which will increase the old company's equipment to a capacity equal to 1,000 of the new Edison lamp of 16 candle-power. The recent extension of the contract with the town provides for 40 lamps, none less than 32 candle-power and three being of 50 candle-power, thus giving an amount of light which will be equal to all public requirements for some time to come. The first contract was only for 13 lamps of 32 candle-power. The extensions are now being made by Mr. J. C. Wilson, superintendent of construction for the Edison Light Company of Canada.

OUR LONDON LETTER.

Coal Supply.—Mr. Hall, the president of the Manchester Geological Society, has issued a warning that our coal supply in Great Britain is likely to be exhausted in 171 years from the present time. His prediction is formed on the personal observation of a government inspector of mines, and there appears no reason to doubt its accuracy, but while fully recognizing what the loss to the English nation would be if that material which has done most to contribute to the industrial and manufacturing greatness of England in the past, I greatly doubt if the universal diffusion of the electric light and the more general adoption of gas for cooking purposes has been taken into consideration, and which will postpone for a considerable period England's evil day.

Gilbert Club.—The inaugural meeting of the Gilbert Club was held on 29th November, and as although Dr. Gilbert's claim to be the first electrician is fully recognized, the public know little of his life; a few particulars in regard to him may be found interesting. He was born in 1540 at Colchester, educated at Cambridge, being a Fellow of St. John's College, and having taken up medicine traveled much abroad. He then became physician to Queen Elizabeth, was elected in 1599 president of the Royal College of Physicians, and died as chief physician to James I. in 1603. His principal fame, however, rests on his experiments and studies in magnetism. He gathered together a fine collection of scientific and magnetic apparatus, and which was left at his death to the Royal College of Physicians and perished in the great fire of London in 1666. In the year 1600 appeared his Magnum Opus, "*De Magnete*," which was printed in folio by Peter Short, of St. Paul's Churchyard, in the City of London, and contained numerous illustrations of his experiments and apparatus. He was buried in the Church of Holy Trinity at Colchester, and the house where he lived is still to be seen there.

Electric Lighting.—Before the weekly meeting of the London County Council at the Guildhall yesterday, Mr. Westmacott presented his report of the highways committee as to the obligations imposed upon the council by the electric lighting legislation of last session. The committee recommended that a station should be built at a cost of £2,100, to include instruments and accumulators; to inspect lines and works, and to certify meters; that an inspector be appointed at a salary of £200, and an officer to supervise the working of the companies in the public streets, and to see that the requirements of the council were carried out, at three guineas per week. All the recommendations were indorsed.

The Ferranti Station.—With regard to the Ferranti station at Deptford, I am told the work is satisfactorily progressing, although great inconvenience and loss of time has been caused by the failure to obtain material owing to the Silvertown strike. There has also, I believe, been serious trouble with the engines from hot bearings. The first engine and dynamo at Deptford, of 1,250 horse-power, has now, however, been running at intervals for the last two or three weeks, and has supplied light to Charing Cross and, on occasions, to some of the Grosvenor Gallery circuits. On November 18th the dynamo was run at 5,000 volts, the current converted to 2,400 at Charing Cross, then sent to the Grosvenor, connected with three of the Grosvenor circuits and converted again to 100 volts at the customers' houses. At a first trial for an hour 23 amperes were transmitted, but in a second trial an hour afterwards 43 amperes were transmitted, corresponding at 72 ten candle-power lamps to ampere, at 2,400 volts to about 3,000 ten candle-power lamps. There was no trouble with the insulation, which has been tried to an equivalent of 40,000 volts with an induction machine before running. I learn that Fowler Waring cables have been substituted for the Ferranti conductors between Deptford and London.

Strike Ended.—I am glad to say the strike at the Silvertown works is now practically at an end. Six hundred men are at work, and business which had been transferred to the French establishment is being brought back, so that employment may be given to the others. The directors have triumphed, a result greatly owing to the sharp and severe wintry weather; but there is no doubt the men's demands were unjust and impracticable.

Motors and Mortars.—The *Electrical Engineer* states that a triturator for grinding drugs has been ingeniously fitted up to work by an electric motor, to save labor in chemists' shops or for drug grinders. The mortar or mortars to the number required are made to revolve by the the electric motor, and a very heavy porcelain pestle hangs inside, the necessary grinding being assured by the revolving of the heavy pestle by friction against the inside of the mortar.

Monument to Joule.—A public meeting has been held in Manchester, presided over by the mayor, Mr. Alderman Mark, to consider the proposal to raise subscriptions and to erect a white marble statue to the late Dr. James Prescott Joule, who was born in Salford, and performed most of his works in Manchester. The proposal was carried unanimously, and Mr. Oliver Heywood was elected treasurer of a very influential committee.

Electricity Handling Whiskey Barrels.—In the Dublin whiskey distillery a circular electric tramway about a mile in circumference has for some time been in operation. An overhead wire is used, current being obtained from the electric light dynamos. The principal use at present is to carry the barrels of whiskey from the distillery to the bonded stores, but arrangements are now being made to carry the grain from place to place.

Lighting Parliament.—Hitherto, when only a portion of the House of Parliament has been lighted by electricity the authorities had their own installation under the control of the First Commissioner of Works, but, as the whole of the House is now to be lighted, a contract has been given to the London and Westminster Electric Supply Company, who are taking steps to carry out the work with the least possible delay, and will enter current through a cable from their nearest station.

London's Proposed Electric Railway.—Every day the Central London electric railway scheme appears to be gaining supporters, and, undeterred by the failure of the electric subway railway bill last year, which proposed to start in neighborhood of Piccadilly and run to the Bank of England, the matter is being pushed rapidly forward. The engineers are Sir John Fowler, Mr. Benjamin Baker and Mr. Greathead. The two first named have gained increased fame as engineers of the Forth Bridge, and Mr. Greathead is engineer to the Southwark Subway, with which the new railway will connect at King William street. The motive power being electricity, there are none of the objectionable fumes of steam locomotives to be provided against and natural ventilation will be obtained from the stations which will be reached by hydraulic lifts from the street surface, similar to those provided for the Southwark line.—Last week the London and Southwark Electric Railway was inspected by Major-General Hutchinson of the Board of Trade, Mr. Spagnoletti and a few other officials of the company. The subway consists of two iron tubes about 10 feet in diameter, one for up and another for down traffic. The railway will be worked by electric locomotives of 100 horse-power. In the trial a speed of 30 miles an hour was attained, but in the ordinary working the rate is to be 20 miles per hour, pulling a train of carriages containing 100 passengers. Trains will run every three minutes. Should the railway prove as successful as is anticipated, there is no doubt metropolitan traveling will be revolutionized, numerous schemes of a similar kind will be brought forward, and it may be that the directors of the District and Metropolitan railways will see their way to increase the comfort of their passengers without in any way adding to the perils of underground traveling.—An underground railroad is being proposed between Edinburgh and Leith, and the question of traction method is under consideration. At Glasgow a bill is to be brought forward next session to contract circular subways under the Clyde, and so to give improved facilities for communication between the city and its suburbs. The engineers are to be the well-known Glasgow firm, Messrs. Simpson & Wilson.

A Removal.—Messrs. Woodhouse & Rawson, Limited, have now left their old offices, 11 Queen Victoria street, E. C., and entered their more commodious premises at 88 Queen Victoria street, E. C. The ground floor is devoted to stock and show rooms, above are the offices and board room, and the second floor is the contract department. The basement is used for store rooms, etc., and two cellars contain an installation, a dynamo driven by a Stockport gas engine, and a battery of 53 storage cells which will supply light to the premises and show the fittings. Although everything is not as yet in perfect order, business is being carried briskly on, and Mr. Reginald Jones, the company's engineer and contract manager who has been superintending the various arrangements, reports no lack of business from any part of the country.

The Frankfort Exhibition.—A meeting of prominent electricians, convened by the Electro-Technical Society of Frankfort, was held of the 30th ult. and resolved to arrange an international electrical exhibition from June 1st to October 31st, 1890. The government has given a site near the Central Railway station. Those desiring to take part in the exhibition must give notice by the 20th December for Europe, or the 15th January for America.

Farthest North.—The electric light has penetrated to Hammerfest, in Norway, the most northerly town in Europe, which is now being lighted by electricity.

Electric Tramway.—At Doncaster (Victoria) an electric tramway 2¼ miles in length is now in operation. The system employed is the overhead Thomsen-Houston, and a pressure of 400 volts is used.

London, Dec. 4. CHARLES FERRONI.

Some Improved Electric Light Cut-Outs.

The cut-out shown in Fig. 1 is one of those important details so necessary in the perfect working of an electric light plant. It is used by the Westinghouse interests. The base and caps are made of porcelain, the cap being locked in place by a quarter turn of a thumb screw passing up through a slotted opening in the center. This makes it easy of access and avoids the annoyance of using the screw driver in inconvenient positions. In the ceiling cut-out, shown in Fig. 3, the drop cord and fuses are carried by the cap, which may be unlocked from the base by a quarter turn, and the fuses replaced without other disturbance.

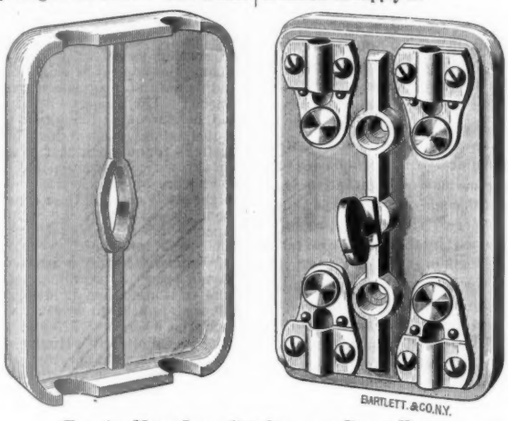


FIG. 1.—MAIN LINE CUT-OUT FOR PLAIN FUSE.

—— The electrical section of the Altoona, Pa., mechanics' library met recently and adopted a resolution appointing a committee consisting of one person from each of the electric light companies, telephone company, telegraph company and railroad company, and one person from among the insurance companies, to ascertain the best methods to bring about the proper legislation or joint action among electrical companies to prevent the indiscriminate running of electrical wires, and remedies for defects now existing in the wires in Altoona.

—— At the annual meeting of the directors of the Wilkesbarre Electric Light Company, a dividend of three per cent. was declared and paid. Charles W. Lee was elected a member of the board, in place of H. Baker Hillman, who is absent in Europe, and with this exception the old board was continued. Superintendent Eberly tendered his resignation, to take effect when a suitable successor shall be secured.

—— During the first seven working days of December the Westinghouse Company sold alternating current apparatus of a total generative power of 8,000 sixteen candle-power incandescent lamps. These contracts were divided among seven different stations, six of which representing increases of plants already established and furnished with the same system. Truly a better proof as to the efficiency of its manufacture could not be asked for.

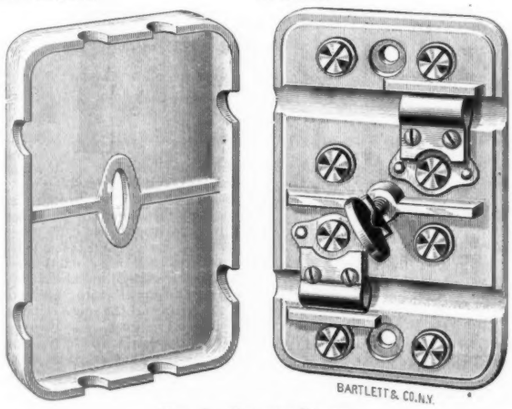


FIG. 2.—BRANCH BLOCK.

—— There is a Swedish firm at Noedköping, Sweden, that has successfully applied electricity for tanning. A pack of hides after being beamed and colored are placed in a revolving drum which contains a strong tanning liquor to which is added a certain quantity of turpentine, a strong electric current being then passed through the drum. It was claimed for this process that the time required for turning out a thoroughly tanned hide was reduced from six or eight months to a few days.

—— At a meeting of the city council, of Salida, Col., it was decided to abandon the present system of street lights and replace the incandescent lamps with arc lights of 2,000 candle-power. Work on stretching the wires for several of the lights was begun a few days ago, and the work is expected to be completed the early part of next week. For the present six arc lights will be used in the business portion of the city, but the entire city will be under the glare of arc lights in the near future.

—— The Dansville, N. Y., Electric Light and Power Company has under consideration the enlargement of its works. It is proposed to light the Sanatorium at that point by incandescent lights, and also to use the lights in residences. The demand for electric lights to replace gas in that city is so great that the present plant of the company is unable to supply it.

—— The plant of the Dansville (N. Y.) Electric Light Company is being enlarged. An engine of 125 horse-power and dynamos will be added. The Sanatorium will use 10 arc and 200 incandescent lights for the main building and cottages. It is expected that 10 additional arc lights will be placed upon the streets soon.

—— The electric light company in Salem, O., Westinghouse alternating current system, has contracted for a second increase of its capacity. The plant was established about two years ago with a capacity of 650 lights, and was secured under a contest of the keenest competition. Since the establishment of the plant, however, the system has proved itself very satisfactory, the result being the double increase of its former capacity. The Westinghouse Electric Company is now about to fill an order for apparatus which will give the station a total lighting capacity of 2,100 sixteen candle-power alternating current incandescent lamps.

—— Another letter has been addressed to Mr. Sutter of the Municipal Electric Lighting Company by the Board of Public Improvements, urging him to push with more vigor the work of preparing to light the city of St. Louis, Mo., with electricity after January 1, 1890.

—— The Lackawanna Railroad Company, which has heretofore used the electric arc system in its train sheds in Hoboken, N. J., has decided to substitute incandescent lights like those in use in its passenger station, believing that there is much less danger of accident in the incandescent system.

—— The Brush Electric Light Company, of Cincinnati, Ohio, applied to the Board of Public Affairs recently for permission to erect a number of electric light poles. The request was declined, and a resolution was passed providing that in the future no more permits for poles will be granted, unless it can be shown that there is an immediate and absolute necessity for power and light.

—— Two bills of complaint have been filed in the United States Court by the Edison Electric Light Company, of New York City, against the Perkins Electric Lamp Company, of Manchester, Conn. The suit is brought to restrain the defendant from manufacturing certain electric lamps, the patents of which the complainants aver are their property. The bills are returnable in January.

—— The electric plant of the Ponce de Leon Hotel, at St. Augustine, Florida, is being overhauled. In all probability two dynamos will be placed in the boiler house of the Alcazar. This hotel now depends upon the dynamos in the Ponce de Leon, and during spring, summer and fall the electric light fixtures remained unused. With dynamos of its own this hotel will be illuminated with electricity throughout the year.

—— At a meeting of the directors of the Ann Arbor (Mich) T.-H. Electric Company, held in Detroit, it was decided to increase the capacity of the plant by the addition of an alternating dynamo and a 125 or 150 horse-power engine. When this is done the company will probably be ready to furnish incandescent lights in private houses. The style of engine will be decided upon in a few days and the improvements will be made at once.

ELECTRIC LIGHT NEWS

—— The old toll bridge at East Hartford Conn., is now lighted by electricity.

—— The electric lights were turned on recently in Moscow, Idaho, and proved a marked success.

—— The Union Pacific Railroad Company, Omaha, Neb., has closed a contract with the Thomson-Houston Company to illuminate the shops and shop office with electricity.

—— The Westinghouse Electric Company has secured the contract of furnishing the apparatus for an alternating current incandescent light plant of 1,500 lights to a company in Greenfield, Mass.

—— Peterborough, Toronto, Canada, will in all probability soon have an electric light carbon factory, which will be established by American and local capitalists. It will be the first of the kind in Canada.

—— The Mt. Morris (N. Y.) Illuminating Company were awarded the contract at that place for furnishing 24 arc lights of 1,200 candle power for $49 per light per year, and six incandescent lights at $10.50 per light to burn from sundown to midnight.

—— Chief engineers of public buildings under the control of the Treasury Department, who are responsible for the proper management of all the steam and electric machinery, are paid a salary of $1,500 per year.

—— The plant of the Louisville Electric Light Company, Louisville, Ky., which was put up with alternating current apparatus, Westinghouse system, is about to be enlarged by a 750 light dynamo of the same system.

—— The Farr Alpaca Company, at Holyoke, Mass., recently placed 600 incandescent electric lights in its weaving department, and is well pleased with the result. The light is clearer and steadier than gas and heat is avoided, an important feature in a room where more than 200 persons are employed.

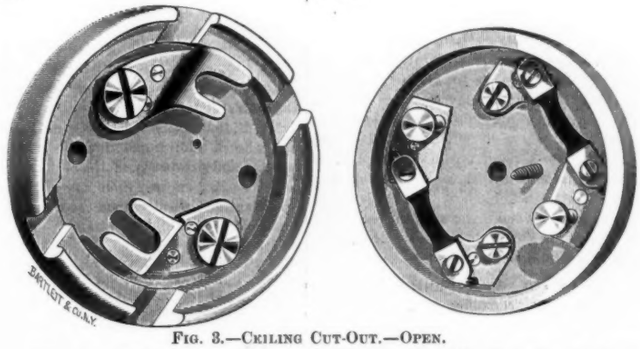


FIG. 3.—CEILING CUT-OUT.—OPEN.

—— The new electric light station at Fitchburg, Mass., which started up several days ago, is running in a most satisfactory manner. The station is equipped with about 650 horse-power, and is capable of running about 450 arc and 3,000 incandescent lights. The total cost of the new plant foots up to almost $45,000, including buildings and all apparatus.

—— The Oskaloosa (Iowa) Edison Light Company, beginning with the first day of December, made a uniform rate of 50 cents per light for 16 candle-power, whether for lighting private dwellings or business houses, and all breakages will be charged for at the rate of 75 cents per lamp for 16 candle-power, and $1.00 for 32. When the company was first organized the rate for private dwellings, churches and public buildings was made very low. A three years' experience shows that lights of this character were being furnished for less than actual cost. The cost of the lights was first estimated on the supposed number of hours they would be used during the day, but it has been found that this estimate was made on a wrong basis.

—— The city of Reading, Pa., has been paying $37,000 annually for a number of years for its electric street lighting. A special committee agreed to recommend councils that Reading erect its own electric light plant.

—— Ice is seriously interfering with the work at the Citizens' Electric Light Company's plant, Burlington, Vt. It completely blocks the water wheels, and the steam power not being sufficient to furnish the whole power, many places are left in darkness. Another engine is now on the way and will soon be running to supply the present deficiency.

—— The Thomson-Houston Electric Company, Lynn, Mass., are beginning to add to their help and apparatus in the blacksmith shop. Four new fires will be started up shortly. A huge pair of shears will be added capable of cutting cold iron ten inches wide by one and one-half inches thick. A new trip hammer, the heaviest in use outside of New York, will be placed in position.

KINDRED INTERESTS

The Pond Engineering Company will furnish and erect a 200 horse-power compound condensing Armington & Sims engine, at the new Omaha Thomson-Houston Company's station in Omaha, Neb. Rope transmission will be used.

The National Carbon Company, of Cleveland, Ohio, since the completion of the new works, are more than ever thoroughly prepared to furnish the electric light companies with a first-class carbon. Their business is continually extending, and the progressive management of President Lawrence and Treasurer Hayes is bringing in valuable returns.

English, Morse & Company, Kansas City, Mo., have recently installed a complete steam plant, including belting, for the Manhattan Electric Light Company, Manhattan, Kans. The boiler orders received by this company for some time past have averaged nearly one pair a day ranging in size from 50 to 100 horse-power, many of them being for extension of electric light plants in the West.

The Brown & Sharpe Manufacturing Company, Providence, R. I., have just issued an illustrated supplement to their catalogue, which presents a number of their large machines. The illustrations appear in tint and show up as masterpieces of the engravers' and printers' art. Electrical purchasers of milling machinery, etc., will find the illustrations of these newer machines of special interest.

The Essick Printer.—The Essick Printing Telegraph Company, which has recently been organized, has leased a wire from the Empire and Bay State Telegraph Company, running from New York to Boston. The REVIEW has received a number of messages from Boston over the system of the Essick Company. They are printed plainly as if by a typewriter, and are in every way satisfactory. It would certainly seem that there is quite a future for this printing telegraph.

The Edison Phonograph Toy Manufacturing Company will not fill any doll contracts to wholesale dealers in time for the holiday season. It has, however, taken quarters at 38 Fifth avenue, New York, where it will exhibit the dolls and carry on a retail business until Jan. 1. After this date it will cease to retail and sell only to wholesalers. This plan was decided upon when it was seen that attempts to deliver to the trade in time for holiday business would be fruitless.

The John A. Roebling's Sons Company have taken the agency for McIntire's electric wire connectors and terminals. The value of these are well known to the electrical field, and can now be secured at the various branch houses of the Roebling's, which are at 117 Liberty street, N. Y.; 170 Lake street, Chicago; 8 California street, San Francisco, besides at the large factory, Trenton, N. J. A neat little circular has been issued by the company explaining the use of the sleeve, connectors, etc., which will be sent on application.

The Westinghouse Electric Company has received an order for one of their 3,000 light machines to be shipped to the Missouri Light and Power Company, of St. Louis, Mo. The central station plant of that company was established about two years ago and furnished with alternating current apparatus, Westinghouse system, to generate light for a capacity of 15,000 lamps. The Westinghouse system of incandescent lighting has since, however, gained such popularity in St. Louis that this new increase became a matter of actual necessity. This makes the St. Louis plant one of the largest electric light stations in the country.

Jordan Adjustable Support for Swinging Lamps.

Mr. L. F. Jordan, 133 Oliver street, Boston, has just obtained the patents on the invention illustrated by the accompanying cuts. The fundamental idea of the device is to provide a mast-arm for arc lamps of such length, that when swung down parallel with the support, the lamp will be in such a position that it can be trimmed from the ground, thus avoiding climbing the support.

The support is made in two styles, as shown. The essential features are the skeleton arm worked by a sprocket wheel at the top of the support over which an endless chain passes; the operation of the arm from the ground by another sprocket wheel turned by a crank, and the enclosing of the sprocket wheels and chains within the standard, which also furnishes bearings for the wheels. A locking device is used to hold the lamp in any desired position. A great saving in time is also made by the workman, being enabled to trim the lamp from the ground. This is an appreciable advantage. Mr. Jordan will immediately enter upon the manufacture and sale of his invention upon an extensive scale.

The Boston Electric Club.

The club held its regular annual meeting on Thursday evening, December 12th, in the club house, 7 Park street, for the election of officers for the ensuing year. President W. J. Denver, presided. There were two tickets in the field, the regular and the independent, though there was little difference between them. The president said that while waiting for the tellers' report, the members present would be glad to hear from some of the club's silver-tongued orators.

Mr. Ridlon responded with a neat speech, and closed with hopes for the continued welfare and prosperity of the club.

Mr. G. B. Neal was then called upon and spoke enthusiastically upon the union of gas and electric lighting interests.

The next speaker was Mr. S. G. Stiness, of Pawtucket, R. I., who also desired the union of electricity and gas. He said that his company was operating a large gas works, two electric light stations, and were building another gas works and electric light plant. They gave their customers whichever light they wanted, but when they found a man burning oil they "went for him," and he generally decided in favor of the electric light.

Col. C. M. Ransom was interrupted in the midst of his interesting remarks by the return of the tellers, who announced the following ticket as having been elected:

President, Henry B. Cram; vice-presidents, 1st, A. L. Rohrer; 2d, Geo. B. Neal; 3d, G. W. Adams; 4th, C. W. Holtzer; treasurer, F. J. Boynton; secretary, R. F. Ross; historian, G. W. Mansfield; board of directors, Edward Blake, F. J. Boynton, Chas. B. Burleigh, Geo. F. Curtiss, H. E. Duncan, E. H. Hewins, Alex. P. Wright, J. R. Lovejoy, J. R. Magee, S. C. Peck, John Post, Jr., H. C. Spaulding, W. A. Stiles, Otis K. Stuart, S. G. Stiness, John C. Wilson, H. J. Pettingell, W. D. Warner, F. W. Harrington, G. E. Hanson.

On motion, the elections of Mr. Cram and Mr. Ross were made unanimous.

On motion of Mr. Neal, the president and four vice-presidents were added to the board of directors.

It was voted to have a dinner at one of the large hotels at the next meeting, on January 6th, when the new officers will be installed, and reports of officers for the past year will be read.

Magnetism vs. Electricity.

BY C. F. DUNDERDALE, ELECTRICAL ENGINEER.

[Written for the ELECTRICAL REVIEW.]

The relation between magnetism and electricity are much simpler and closer than is generally understood and, when it is properly considered, it will be found to be practically the same thing; the difference being that the latter is the element in motion, while the former is in a state of rest. Iron, owing to its peculiar character of crystallization, seems to offer the best medium for demonstrating the latter characteristic. It would seem that under the influence of electricity, the atoms of iron become more or less attenuated or separated from each other than in their normal condition, according to the degree of fineness of the crystals and the degree of charge. The holding property is largely influenced by the presence of carbon in the combination. Common cast iron being of a coarse granular crystallization, and containing a greater proportion of carbon than steel, does not retain much of the charge, after being under the influence of an electric current which would seem to be owing to the lesser amount of space obtained between the coarse crystals wherein for it to lodge, and to the polarizing effect of the presence of the carbon indigenous to that material.

When iron is subject to the passage of electrical currents, the atoms arrange themselves in a manner that give semblance to the direction of the current and assume the peculiar phase thereof, producing the negative and positive poles that accompany the direction of flow. The permanency of this phase depends on the molecular fineness of the atoms forming the grain. The finer the grain the greater is the atomic interstitial space, and the greater the charge, because each atom being charged becomes repellant to its neighbor, causes a larger space or interval in the aggregate where the number of atoms is great, as in fine grained steel, than would occur in the same mass with coarser crystals; therefore it becomes a stronger magnet after the charging current is removed, and in the case of steel, with its low percentage of carbon, the depolarizing action of the carbon is not obtained, and so the charge remains in the mass, and we have a permanent magnet, comparatively speaking, although these magnets become, in time, depolarized, even by their small percentage of carbon, unless means are taken to connect the two ends by an armature in order that the motion of the currents may be kept up and the atoms prevented from coalescing into their normal condition.

When wrought iron is subjected to the influence of electrical currents, it being of a fibrous character, more than crystalline, the fibres become raised and separated as the hairs on an angry dog's back, and by virtue of their fibrous formation, in which one end of each fibre is supported by the other, a much greater interval space for the charge to reside is obtained than can be in the crystalline formation, and, therefore, the greater the electrical charge, had, consequently, the greater the degree of magnetic attraction. This is why wrought iron, mass for mass, makes a better electro-magnet than cast iron, but the presence of the greater amount of carbon, and the varying angle of relation of each fibre to the other under the law of mutual attraction more rapidly gives up its charge and returns to the inert condition. Either wrought or cast iron, once subjected to a charge of an electrical current, will for a long period retain a small fraction of the same in the latent state, and this is taken advantage of in the starting of dynamos built with electro-magnets as a constant nucleus for producing the maximum current that the machine is capable of.

When the separation of the atoms has reached its maximum attenuation, and the intervening space fully occupied by the charge, the magnet is said to be saturated, and its limit of magnetic attraction is then reached. The homogeneity of other metals and the consequent difficulty of the separation of their atoms, renders them but indifferent mediums for magnetic charges and attraction, but this very qualification makes them better conductors of the electrical current. We might safely say that their capacity for conducting electricity, is the reciprocal of their capacity to become magnets under the electric current influence.

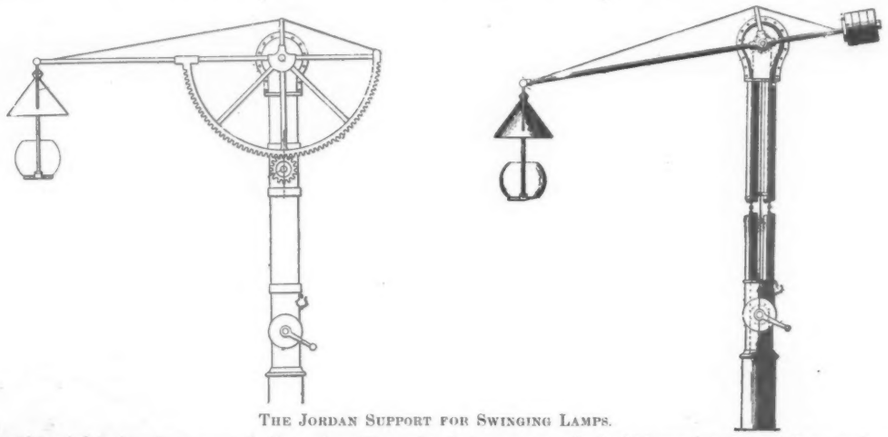
Whether electricity is arrested in the interatomic space of metallic crystallization or fibre, or is in motion, it always has a potential or an impetus to move; and this always produces, wherever it is found, the two nodes or phases of attracting similar, or in the same direction, potential in other charges, or repelling those of opposite direction potential, and once ensconced between molecular formation, causes a segregation thereof in the same order.

We might, *in extremis*, compare the stellar world to a mass of atoms kept in interstellar space from coalescing, by their tendency to repel each other, caused by the residual electrical charge, inherent in each, the result of their motion.

Heat, light, motion, force, electricity and all conceivable power are simply the different manifestations of the same element, which may be safely set down as the essence of that great influence which moves all things, and which to the limited human mind passeth all understanding. Where two atoms of iron are opposed to each other, under the electrical charge, and being both of the same relation to each other, exert no influence on the electric charge to exhaust itself in maintaining the equilibrium, and so it remains in the mass and the mass remains a so-called permanent magnet. But if carbon is present, it being opposed to the ferreous atoms and, by its negative character, soon exhausts the charge from maintaining the equilibrium, and the atoms becoming freed from their disintegrating element coalesce, and the mass loses its magnetic properties almost instantly. Although the departure from the *instanter* is often manifested in the action known as the "lag" of electro-magnets, and varies with the degree of carbon contained in the iron, and its freedom from fibre formation, the greater the degree of fibre the less the lag, and the lesser the amount of carbon contained in the mass, and the finer the comminution of the grain, the greater the amount of residual electricity remaining.

It is quite possible to so charge a bar of steel so that its two ends will be of the same polarity, while its center a dividing point of opposite polarity. This is accomplished by causing the charging current to be moved in both directions, from the center towards the ends, thus setting the atoms in opposite potential to each other up to the dividing line at the center, at which point of demarcation the two halves would be the same as two separate pieces of steel, with their two negative poles opposed.

Some gases are susceptible of being converted into magnets, and, as a sample, we may mention oxygen, which, on being passed through the brush form discharges of a static current, becomes charged with the electricity, the effect of which on the atomic grouping is to reduce their attenuation and bring them closer together, increasing their specific gravity beyond the range of that



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assigned for gases, so that it will separate from any mechanical mixture, in violation of the law of the diffusion of gases, and will have magnetic properties similar to the steel permanent or iron electro-magnet, which is evinced in its effect on the magnetic compass.

The residual character of the electric charge is further manifested in the odor, always detected in the vicinity of disruptive electrical discharges or the silent discharge of the electrical brush.

The cellular formation and mineral character of the sap causes certain forms of vegetation to become charged with magnetic charges, which they readily give up to human armatures on being touched; so have certain fishes, well known to students of natural history; these are simply organic examples of the foregoing mentioned causes, under which category they may be classed *ad infinitum*.

Seeing to a Distance by Electricity.

A correspondent to *La Lumiere Electrique* thus comments upon M. L. Weiller's paper which appears in *Le Genie Civil*, vol. 15, p. 570:

The writer endeavors to solve the important question of vision to a distance by electricity, by means of a combination consisting of a selenium cell, a gas telephone and revolving mirrors, forming a special apparatus which he designates a phoroscope, and which we will briefly discuss.

The question of vision to a distance by electricity is governed by the two following fundamental principles. In order to get the impression of the form, outlines and details of one or several objects, it is not necessary —1. That the eye should receive all the rays proceeding from it. 2. That it should receive, at the same time, the luminous rays necessary for vision.

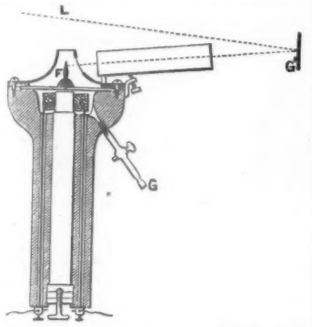

FIG. 1.—L, Lunette; F, Flame; G, Gas; G1, Glass.

Some very simple examples will demonstrate the first principle. We can see an object very clearly through wire gauze, and the image is perfect if the interstices are large and the wire fine. Carpets and mosaic seen at a certain distance do not seem to be formed of a number of parallel lines, or by the juxtaposition of little stones. An engraving, a picture, and especially a chromo-lithograph, show at a distance no discontinuity in the work, although the engraving is composed of lines and the chromo-lithograph of separate little dots.

We see thus that it is possible to have a sufficiently clear perception of an object by the vision of a system of more or less luminous lines forming a kind of pattern.

The second principle is quite as well known, and as deduced from the duration of the luminous impressions upon the retina, a period of about one-tenth of a second.

A series of impressions succeeding one another in a very short time produces the effect of simultaneous impressions, and it follows that in order to perceive the image which we have called the pattern, it is sufficient to receive the luminous impressions of the different lines that constitute it in an interval of time less than one-tenth of a second.

It was by taking this principle as a basis that Lissajous studied from an optical point of view the vibratory movements of bodies. His experiments are so well known that we need not enter into them here. Lissajous' curves are produced in a rectangular portion of a picture. If, on the other hand, this object possesses the power of lighting, all the rays proceeding from the space occupied by the curve will, in an excessively short space of time, converge at one point after having been subjected to a double reflection on the mirrors of the two tuning forks that were employed for this experiment.

We may substitute for these forks any movable system whatever, bearing a series of mirrors arranged in such a manner that the displacement of each of them brings upon the same straight line all the rays projected from a portion of an illuminated object. Let us suppose these mirrors to be placed on a

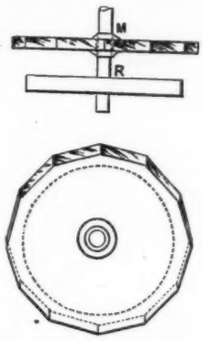

FIG. 2.—M, Mirrors; R, Regulator. 30 revolutions per second; 300 glasses on the sides instead of 12.

circle turning upon an axis perpendicular to its plane, and each of them making a different angle near 90° with this plane. To each mirror there will be a corresponding series of parallel lines in the picture, and if the rotation is sufficiently rapid all the rays proceeding from the object represented in the picture will meet at the same time, in as short an interval of time as required. It is thus possible to bring to one point all the luminous rays proceeding from a pattern, and each portion of the image thus producing its impression upon the retina in succession, it is sufficient that the interval in which these impressions succeed one another, should be sufficiently short for them to be rendered simultaneous.

The transformation of the luminous waves into electric currents is performed by means of a radiophonic receiver forming part of an electric circuit. This receiver may be a cell of selenium lamp-black, hydrogenated palladium, etc., the resistance of which varies with the quantity of light received. The different portions of the pattern will act differently according to the quantity of light emanating from them, and in an interval of time less than one-tenth of a second; the variations of resistance of the circuit will correspond to the image observed.

In order to solve the opposite problem, *i. e.*, to extract this image from the circuit at the receiving station, the writer proposes to employ the gas telephone, which is an instrument of extreme sensitiveness. It consists of an ordinary telephone (Fig. 1) in which the portion comprised between the plate, the bobbin and the inner sides is in communication with a gas pipe; the vibrating membrane is pierced in the center with a little hole, through which escapes the gas which is lighted; this little flame will undergo a variation in brilliancy at each movement of the membrane, and it will produce a continuous succession of rays similar to those arriving upon the radiophonic receiver. In order to show them and form an image similar to the pattern, a system of mirrors is employed (Fig. 2) similar to that used at the first station, but acting in the reverse way. It is evident that these two apparatus must act synchronically like the Hughes and Baudot regulators employed in telegraphy.

Station 2 will reproduce upon a sheet the lines taken upon the image at Station 1.

The writer gives the name of phoroscope to an apparatus of this description, the different parts which we have described being combined according to the plan shown in Fig. 3. The image that we wish to transmit is broken up into a series of parallel lines, the different points of which act in succession upon a selenium cell making the intensity of the current connecting the two stations vary. These variations in electrical intensity are transformed by the gas telephone into variations of luminous intensity, and the successive changes of brilliancy of the little flame are projected upon a sheet at points corresponding to the various points of this sheet.

Theoretically, nothing can prevent this double transformation of luminous intensity into electric intensity, but the realization of the experiment is surrounded with difficulties which make us fear that it will be long before a practical phoroscope is produced, but this should not discourage enterprising and persevering physicists.

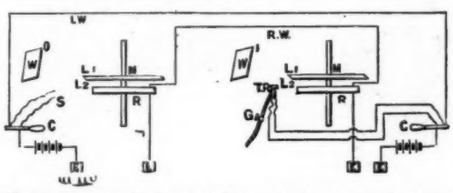

FIG. 3.—L. W., Line Wire; R. W., Regulator Wire; L1, L2, Lenses; M, Mirror Apparatus; R, Regulators; O, Object; I, Image; S, Selenium Transmitter; C, Commutators; G, Gas; T. R., Telephone Receiver; E, Earth.

Oil Under the Boilers—One Pound Equals Two of Coal.

TO THE EDITOR OF ELECTRICAL REVIEW:

My attention has been called to an article that appeared in your paper of August 31st, relating to the electric light station in Springfield, where the fuel is oil used by the Aerated Fuel Company's system, and you say that the Aerated Fuel Company claim that the fuel supply is eight times as cheap as coal. This is entirely wrong and is liable to do us much injury. There is only about so much heat in a pound of oil, and only a given amount in a pound of coal, and the best results that can be obtained with oil as compared with the best Cumberland coal, is about two to one, and one pound of oil will do the work of two pounds of coal for generating steam. For forging purposes, where a great deal of heat from coal is necessarily wasted, we are making a pound of oil do the work of from six to eight pounds best hard coal, but it cannot be done under boilers for the reasons above stated.

J. H. BULLARD, *Manager*.

Springfield, Mass., Dec. 10, 1889.

A very interesting paper was recently read before the South Stafford Institute of Iron and Steel Works Managers at Dudley, England, on "The Application of Electricity to Works and Mills." The reader stated that there was everything to recommend an electrical transmission plant. Waste heat from blast furnaces could be used miles away; steam boilers could be placed near the colliery to save hauling the coal; the power of a river or stream could be used and hundreds of horse-power conveyed along small copper wires, while the places could be lighted by electricity at a very low cost.

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ELECTRICAL PATENTS

INDEX OF INVENTIONS FOR WHICH LETTERS PATENTS OF THE UNITED STATES WERE ISSUED ON DECEMBER 10, 1889.

416,712 Electrical annunciator; Franklin S. Carter, Burlington, N. J.

416,720 Commutator; J. Allen Dalzell, Hartford, assignor to the Schuyler Electric Co., Middletown, Conn.

416,732 Telegraph transmitter; Orville D. La Dow, Mechanicsville, N. Y., assignor of one-half to Frederick T. Bickford, Washington, D. C.

416,742 Circuit-closing device for matrix-making machines; Caspar L. Redfield, Minneapolis, Minn., assignor by mesne assignments to the Chicago Matrix Machine Co.

416,746 Coupling electric motors; Edwin W. Rice, Jr., Lynn, Mass.

416,754 Telephone switch; Joseph Sack, Dusseldorf, Germany.

416,762 Induction coil transformer, etc.; Elihu Thomson, Lynn, Mass.

416,779 Automatic fire extinguisher; Elliott P. Gleason, New York, N. Y.

416,808 Testing apparatus for multiple switchboards; Chas. E. Scribner, Chicago, Ill., assignor to the Western Electric Co., same place.

416,847 Hanging device for electric arc lamps; James McLaughlin, Chicago, Ill.

416,862 Electric light support; Benjamin Schardt and William Lutzenberger, Dayton, Ohio, assignors of one-third to Hermann Fretzinger, same place.

416,873 Cutting metal by electricity; Benjamin C. Tilghman, Philadelphia, Pa.

416,947 Thermostat; William P. Powers, La Crosse, Wis.

416,971 Electric door alarm; Edwin W. Taylor, Charlottetown, Prince Edward Island, Canada.

417,009 Telephone transmitter; Joseph C. Eichmeyer, Utica, N. Y., assignor of nine-tenths to Frank J. Callanen, Joseph R. Swan and Augustus H. Palmer, all of same place.

417,013 Electrical pipe or metal welding machine; Herbert E. Fowler, New Haven Conn., assignor of one half to D. T. Hedges, Sioux City, Ia.

417,018 House telephone exchange; William M. Goodridge, Highland Park, assignor to the Western Electric Co., Chicago, Ill.

417,052 Electric berth register for sleeping cars; Frederick E. Liebiutz, Birmingham, Ala.

417,055 Secondary battery; Chas. H. Logan, Totonto, Ontario, Canada.

417,075 Electric gas lighter; Nelson Newman, Springfield, Ill., assignor of two-thirds to Geo. A. Sanders and Samuel J. Willett, both of same place.

417,088 Method of preparing electrodes for secondary batteries; James K. Pumpelly, Chicago, Ill., assignor of one-half to Frank D. Thomason, same place.

417,089 Compound dynamo-electric machine; Frank B. Rae, Detroit, Mich., assignor to the Detroit Electrical Works, same place.

417,095 Electric conductor; John J. Saville and James H. Winspear, Omaha, Neb.

417,117 Electric indicator for grain bins; Adrial C. Thompson and Horace E. Newton, Quelly Center, Neb.

417,120 Drop-switch for electric conductors; Chas. J. Van Depoele, Chicago, Ill.

417,121 System of switching for conduit electric railways; Chas. J. Van Depoele, Lynn, Mass.

417,122 System of supplying currents to electric railway systems; Chas. J. Van Depoele, Lynn, Mass.

417,132 Electro valve-operating device for elevators; Cyrus W. Baldwin, Yonkers, N. Y., assignor to the Hydraulic Elevator Co., Chicago, Ill.

417,158 Secondary battery plate; Victor H. Ernst, Jersey City, N. J.

417,188 Electric danger alarm for railway block signals; James H. Hunter, New York, N. Y.

417,198 Electric gas lighter; Nelson Newman, Springfield, Ill.

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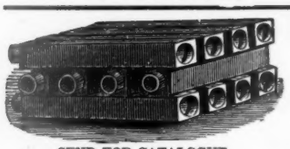

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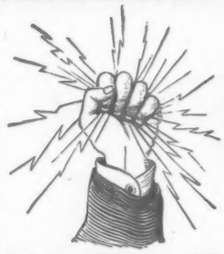

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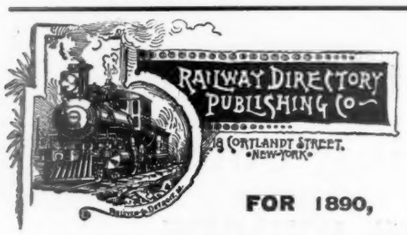

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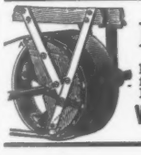

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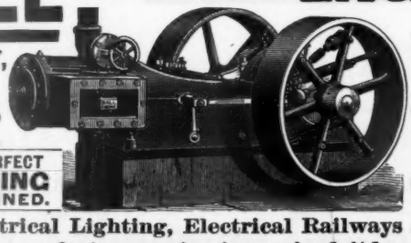

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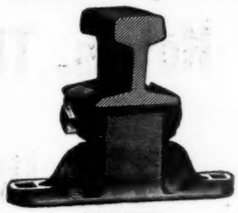

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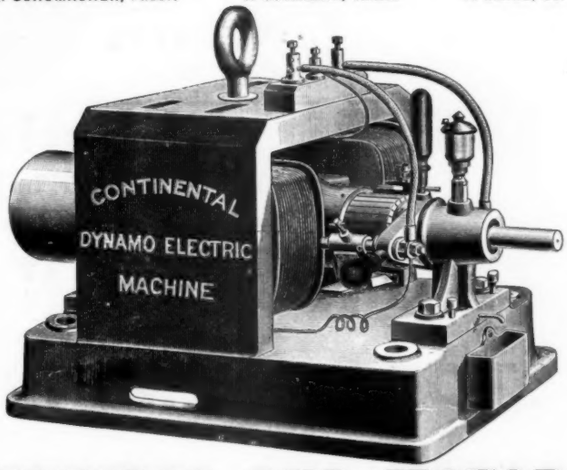

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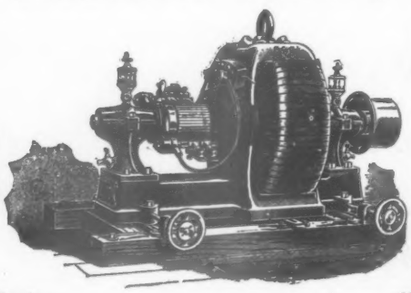

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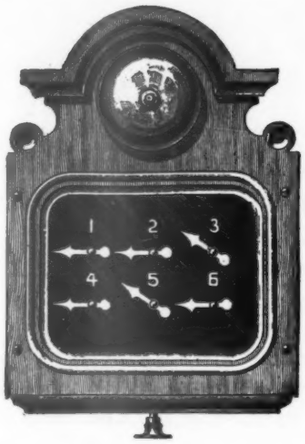

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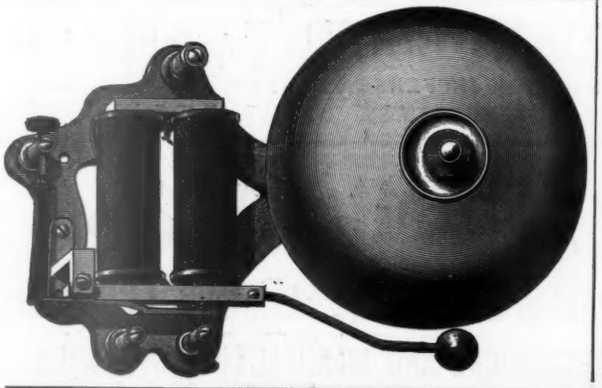

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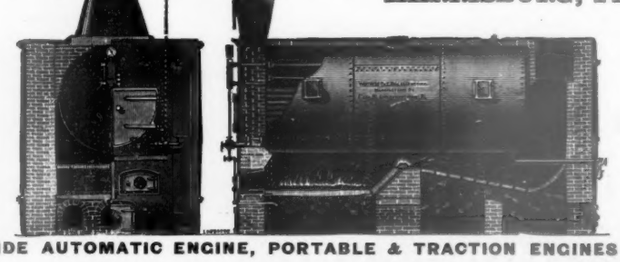

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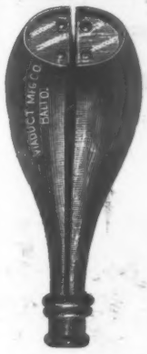

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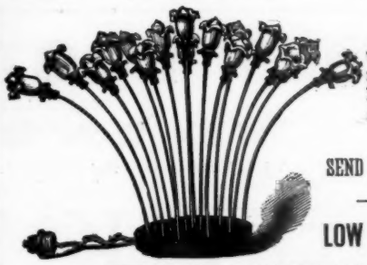

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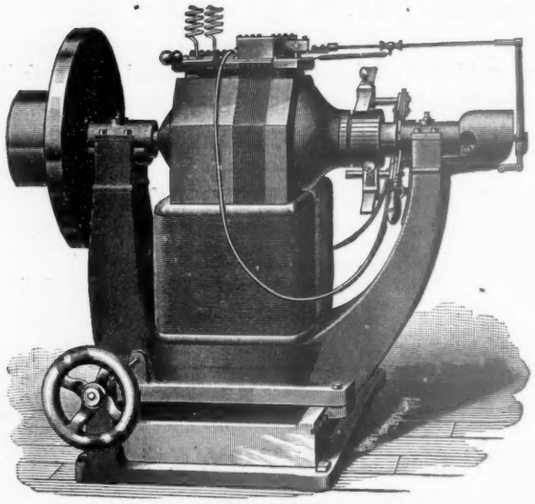

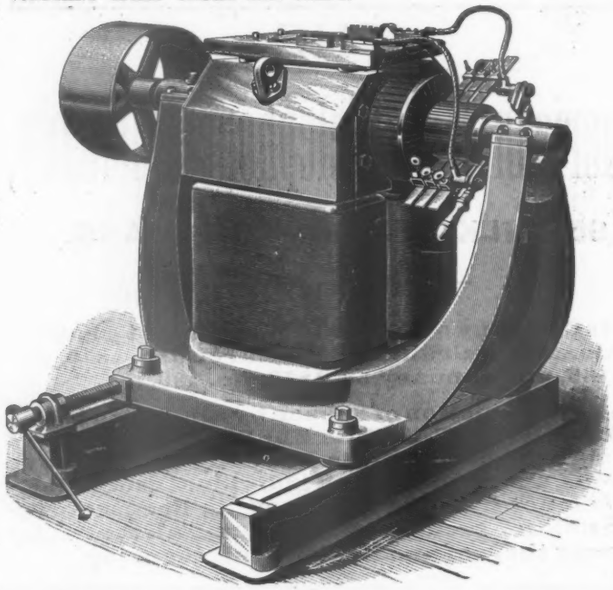

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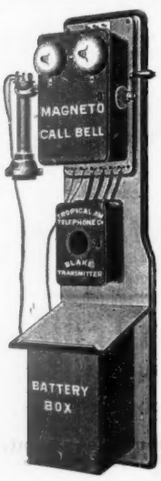

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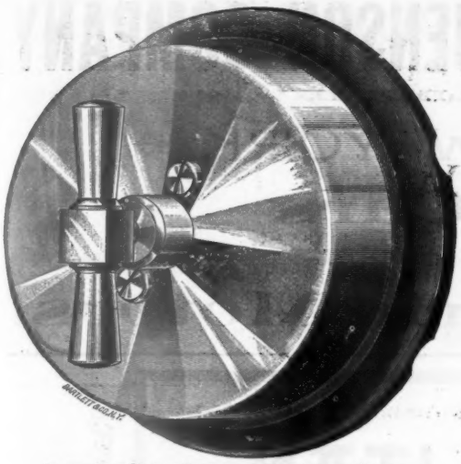

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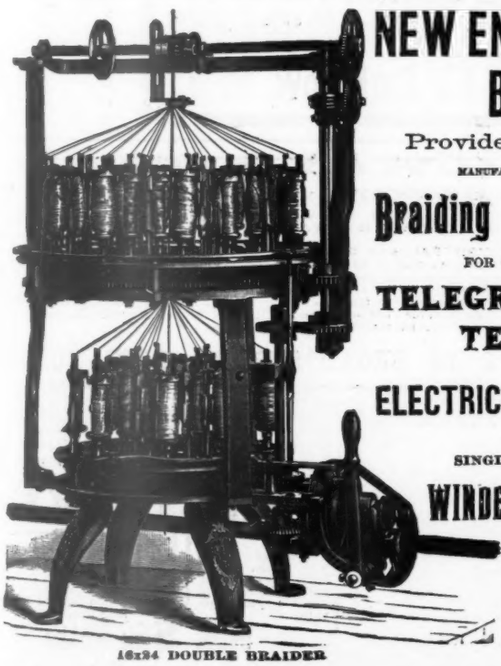

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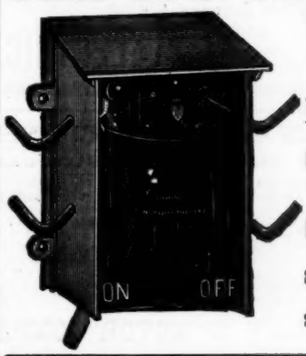

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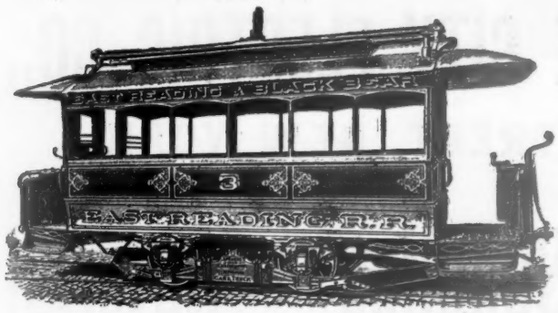

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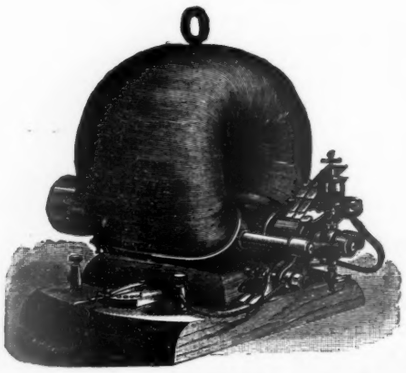

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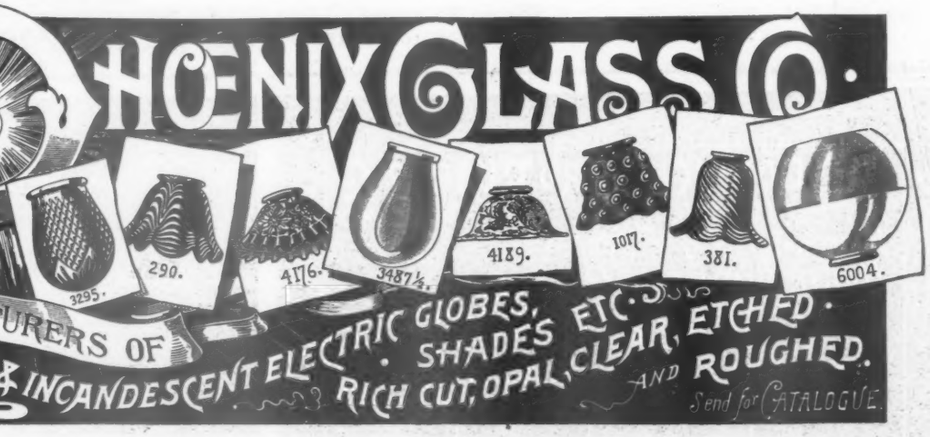

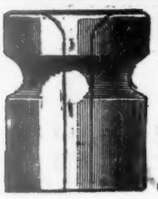

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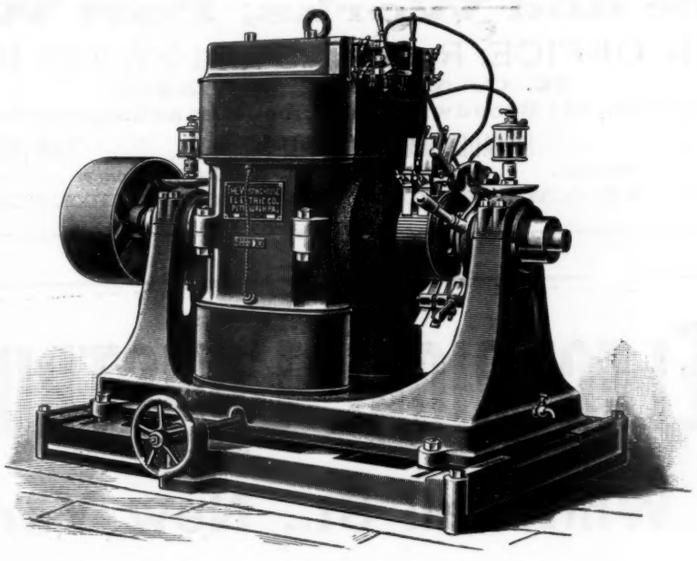

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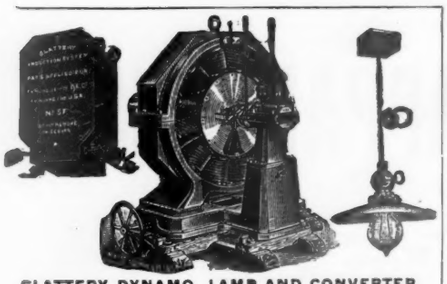

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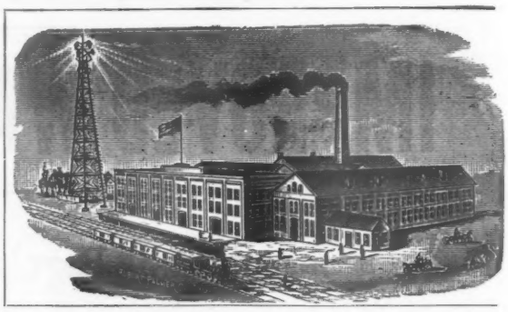

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